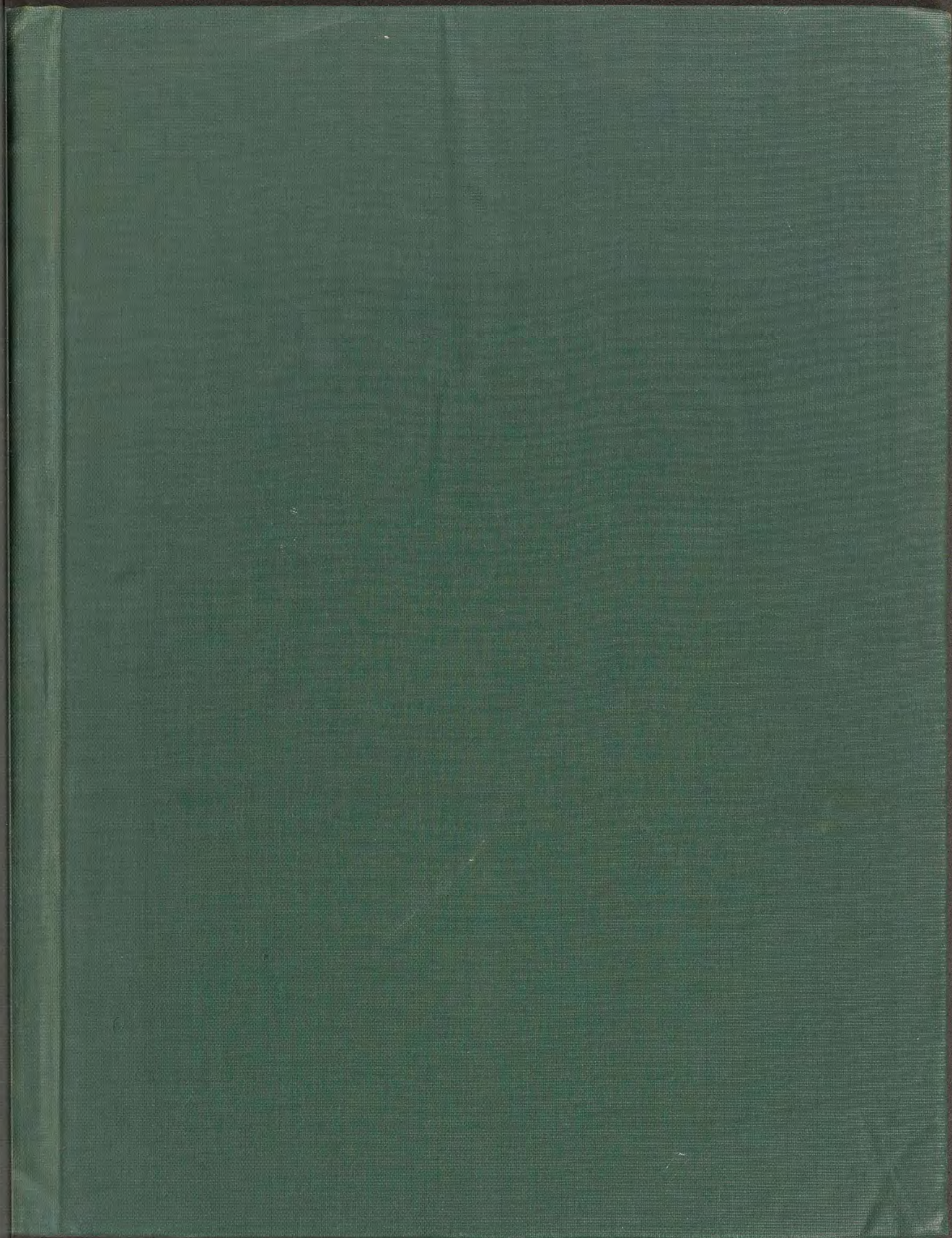
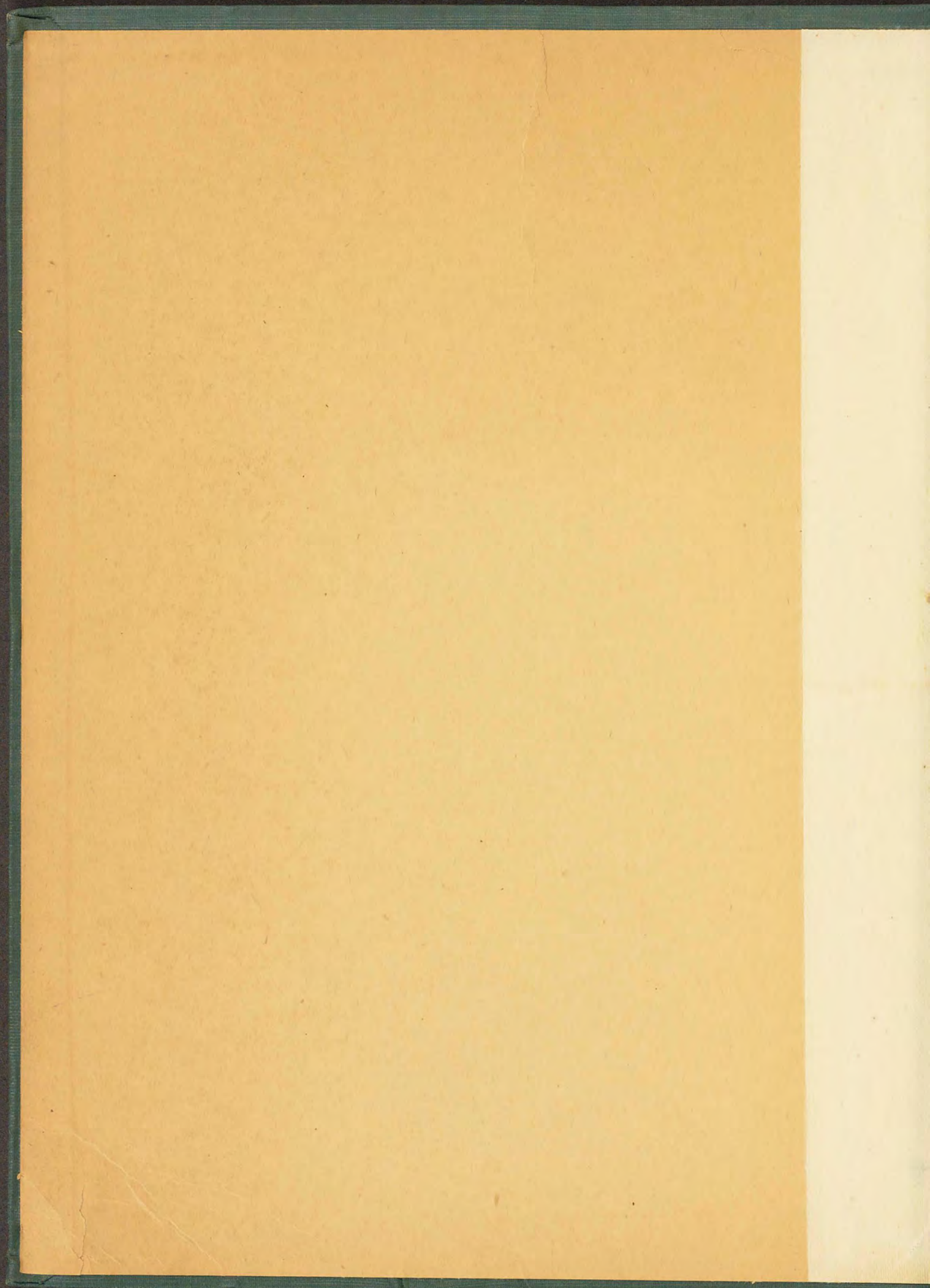
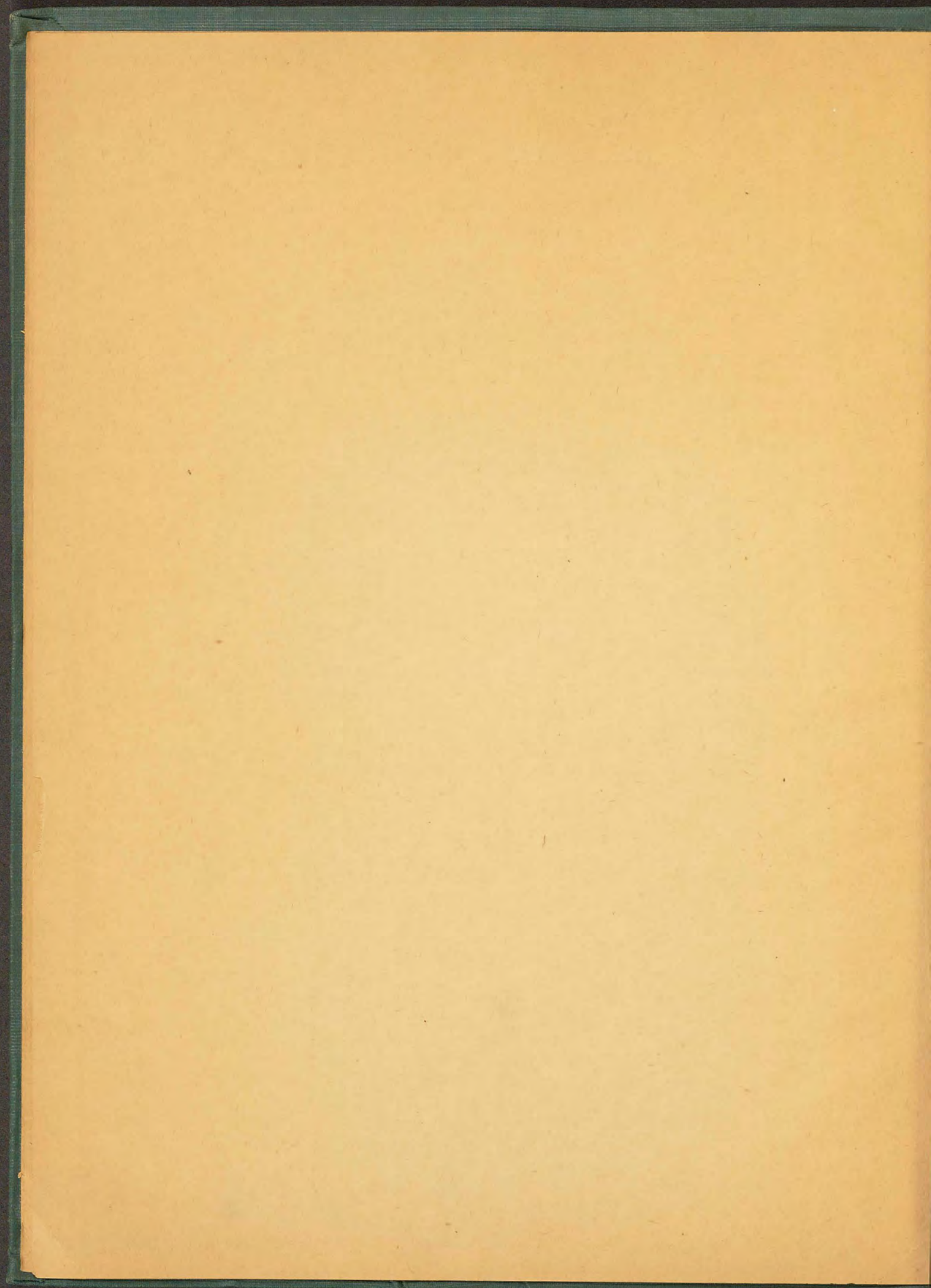








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NOTES ON PRECIOUS STONES

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PRECIOUS STONES ARRANGED ACCORDING TO COLORS

Colorless and White

Achroite (Tourmaline)
 Adularia (Moonstone)
 Arkansas Diamond (Quartz)
 Beryl
 Brazilian Pebble (Quartz)
 Cacholong (Opal)
 Chalcedony (Quartz)
 Diamond
 Hyalite (Opal)
 Hydrophane (Opal)
 Jargoon (Zircon)
 Kunzite (Spodumene)
 Matura Diamond (Zircon)
 Mocha Stone (Tree Agate)
 Moonstone (Adularia)
 Moss Agate (Quartz)
 Opal
 Orthoclase (Moonstone)
 Orthose (Orthoclase)
 Phenacite
 Quartz (Rock Crystal)
 Sapphire (White)
 Sardonyx
 (White and black or red)
 Spinel
 Tourmaline
 White Sapphire
 White Spodumene (Kunzite)
 White Topaz
 White Zircon (Jargoon)

Red

Agate (Quartz)
 Almandine (Garnet)
 American Ruby (Garnet)
 Arizona Ruby (Garnet)
 Carnelian (Quartz)
 Cinnamon Stone (Garnet)
 Colorado Ruby (Garnet)
 Essonite (Hessonite)
 Fancy Sapphire (Corundum)
 Fire Opal
 Garnet
 Girosol (Fire Opal)
 Harlequin Opal
 Hessonite (Cinnamon Stone)
 Madagascar Garnet
 Opal Fire
 Opal Honduras
 Opal Mexican
 Pyrope (Bohemian Garnet)
 Rhodolite (Garnet)
 Ruby Ceylonese (Garnet)

Red (Continued)

Ruby Oriental
 Ruby Siam
 Ruby Siberian
 (Tourmaline)
 Sard (Quartz)
 Sardonyx (Quartz)
 Spessartite (Garnet)
 Spinel
 Star Ruby
 Vermeille (Garnet)
 Zircon

Pink and Lilac

Balas Ruby (Spinel)
 Beryl (Rose)
 Beryl (Pink)
 Brazilian Ruby (Pink Topaz)
 Carnelian (Quartz)
 Diamond
 Fancy Sapphire
 Garnet
 Jasper (Quartz)
 Kunzite (Spodumene)
 Madagascar Garnet
 Morganite (Rose Beryl)
 Opal
 Pink Amethyst
 Pink Topaz (Precious)
 Rhodonite
 Rose Beryl (Morganite)
 Rose Quartz
 Rubellite (Tourmaline)
 Ruby Balas (Spinel)
 Ruby Ceylonese (Garnet)
 Ruby (Pink)
 Sapphire (Pink)
 Spinel
 Spodumene (Kunzite)
 Star Ruby
 Thomsonite
 Thulite
 Zircon

Blue

Azurite
 Malachite
 (Blue and Green)
 Benitoite
 Chrysocolla
 Cordierite (Iolite)
 Cyanite (Sappare)
 Dichroite (Iolite)
 False Lapis (Dyed Quartz)

Blue (Continued)

Fancy Sapphire
 Iolite
 Lapis Lazuli
 Lapis Lazuli Matrix
 Lynx Sapphire (Iolite)
 Montana Sapphire
 Odontolite (Fossil Turquoise)
 Opal
 Persian Turquoise
 Persian Turquoise Matrix
 Sappare (Cyanite)
 Sapphire Australian
 Sapphire Burma
 Sapphire Cashmere
 Sapphire Ceylon
 Sapphire d'eau
 Sapphire Lynx
 Sapphire Montana
 Sodalite
 Spinel
 Star Sapphire
 Swiss Lapis (False Lapis)
 Turquoise American
 Turquoise Egyptian
 Turquoise Fossil
 Turquoise Persian
 Turquoise Matrix
 Turquoise Matrix (Black)

Light Blue

Adularia (Moonstone)
 Aquamarine
 Asteria (Star Sapphire)
 Benitoite
 Beryl
 Brazilian Sapphire (Topaz)
 Chrysocolla
 Diamond
 Fancy Sapphire
 Labradorite
 Montana Sapphire
 Moonstone (Adularia)
 Odontolite (Fossil Turquoise)
 Orthoclase (Moonstone)
 Orthose (Orthoclase)
 Sapphire Cashmere
 Sapphire Ceylon
 Sapphire Montana
 Spinel
 Star Sapphire
 Topaz (Precious)
 Tourmaline
 Turquoise

PRECIOUS STONES ARRANGED ACCORDING TO COLORS

Green and Greenish	Green and Greenish (Continued)	Violet (Continued)
Alexandrite (Chrysoberyl)	Titanite (Sphene)	Amethyst Brazilian
Amazonite	Topaz (Precious)	Amethyst Oriental
Andalusite (Chiastolite)	Turquoise	Amethyst Siberian
Aquamarine	Uralian Emerald	Amethyst Uruguay
Avanturine (Quartz)	(Demantoid)	Axinite
Azurite-Malachite	Uthallite (Variscite)	Benitoite
(Blue and Green)	Uvarovite (Garnet)	Fancy Sapphire
Bloodstone (Heliotrope)	Variscite (Uthallite)	Garnet
Bobrovka Garnet	Vesuvianite (Idocrase)	Opal
(Demantoid)	Zircon	Quartz (Amethyst)
Brazilian Emerald		Rhodolite
(Tourmaline)		Sapphire
Californite (Vesuvianite)	Yellow and Yellowish	(Oriental Amethyst)
Catseye Oriental		Sodalite
(Chrysoberyl)		Spinel
Catseye Hungarian (Quartz)	Beryl	Star Sapphire
Chiastolite (Cross Stone)	Cairngorm (Quartz Topaz)	Syrian Garnet (Almandine)
Chlorastrolite	Catseye (Chrysoberyl)	
Chloromelanite (Jadeite)	Chrysoberyl	
Chrysoberyl	Chrysolite (Chrysoberyl)	
Chrysolite (Peridot)	Cinnamon Stone (Garnet)	
Chrysolite Oriental	Citrine (Quartz)	
(Chrysoberyl)	Crocidolite (Quartz)	
Chrysoprase	Cymophane	Brown and Brownish
Cymophane	(Chrysoberyl Catseye)	
(Chrysoberyl Catseye)	Diamond	Andalusite (Chiastolite)
Demantoid (Garnet)	Essonite (Garnet)	Avanturine (Quartz)
Diamond	Fancy Sapphire	Axinite
Emerald	Fire Opal	Catseye (Chrysoberyl)
Emerald Oriental (Sapphire)	Garnet	Chiastolite (Andalusite)
Fancy Sapphire	Golden Beryl	Cinnamon Stone (Garnet)
Green Stone	Hessonite (Garnet)	Citrine (Quartz Topaz)
(New Zealand Jade)	Hyacinth (Garnet)	Cymophane
Gooseberry Stone	Hyacinth (True) Zircon	(Chrysoberyl Catseye)
(Grossularite)	Jacinth (Hyacinth)	Diamond
Grossularite (Garnet)	Opal	Epidote
Heliotrope (Bloodstone)	Quartz (Topaz)	Essonite (Hessonite)
Hiddenite (Spodumene)	Rubicelle (Spinel)	Fancy Sapphire
Hungarian Catseye (Quartz)	Sapphire	Hair Stone (Quartz)
Idocrase (Californite)	Topaz Brazil	Oligoclase (Sunstone)
Imperial Yu Stone	Topaz Cairngorm	Pistacite (Epidote)
(Avanturine)	Topaz Citrine	Quartz (Smoky)
Jade (Chinese)	Topaz Golden	Rutilated Quartz
Jade (New Zealand)	Topaz Madeira	(Hair Stone)
Jadeite (Chloromelanite)	Topaz Oriental	Sphene
Malachite	Topaz Precious	Spinel
Moldavite (Obsidian)	Topaz Spanish	Sunstone
Nephrite (Jade)	Zircon	Topaz Brazilian
New Zealand Green Stone		Topaz Citrine
(Jade)		Topaz Precious
Olivine (Bobrovka Garnet)	Violet	Topaz Smoky
Opal		Tourmaline
Peridot (True Olivine)	Almandine (Garnet)	Venus Love Arrow
Prase (Quartz)	Amethyst American	(Hair Stone)
Quartz Catseye (Hungarian)	Amethyst Auvergne	Zircon
Sapphire		
Sphene (Titanite)		

TABLE OF HARDNESS AND SPECIFIC GRAVITY

	Hardness	Specific Gravity		Hardness	Specific Gravity
Alexandrite (Chrysoberyl).....	8.5	3.65-3.8	Hiddenite.....	6.5.-7.	3.13-3.19
Almandine (Garnet)...	7.5	4. -4.2	Hyacinth.....	7.5	4.4 -4.7
Amazonite.....	6.	2.55	Jade.....	5.75	3.
Amber.....	2.-2.5	1.065-1.08	Jadeite.....	6.5-7.	3.3
Apatite.....	4.5-5.	2.95-3.25	Jasper.....	7.	2.31-2.67
Avanturine.....	7.	2.66	Jet.....	2.5	1.35
Axinite.....	6.5-7.	3.-3.3	Kunzite.....	6.5-7.	3.18
Benitoite.....	6.5	3.64-3.65	Labradorite.....	6.	2.55
Beryl.....	7.5-8.	2.67-2.73	Lapis Lazuli.....	5.-5.5	2.38-2.42
Bohemian Garnet....	7.5	3.69-3.78	Malachite.....	3.5-4	3.6-4.
Brazilian Emerald..	7.-7.5	3.-3.1	Moonstone.....	6.-6.5	2.4-2.6
Cats Eye (Chrysoberyl).....	8.5	3.-3.8	Morganite (Rose Beryl).....	7.5-8.	2.67-2.73
Cats Eye (Quartz)...	7.	2.5-2.8	Obsidian.....	5.5	2.5-2.6
Chiastolite (Andalusite).....	7.25	3.17-3.19	Olivine (Green Garnet).....	6.5	3.8-3.9
Chlorastrolite.....	6.	2.8-3.	Opal.....	5.5-6	2.-2.1
Chrysoberyl.....	8.5	3.65-3.8	Peridot (Chrysolite).....	6.5-7	3.3-3.5
Chrysolite.....	6.5-7	3.3-3.5	Phenacite.....	7.9-8.	2.96-3.
Chrysoprase.....	7.	2.56	Quartz.....	7.	2.5-2.8
Cinnamon Stone (Garnet).....	6.5	3.5-3.56	Rhodolite.....	7.25	3.84
Cyanite.....	5.-7	3.45-3.7	Ruby.....	9.	3.9-4.1
Demantoid (Green Garnet).....	6.	3.85	Sapphire.....	9.	3.9-4.1
Diamond.....	10.	3.5-3.6	Sodalite.....	5.5	2.4
Dichroite.....	7.-7.5	2.56-2.57	Spessartite.....	6.5-7.	4.2-4.27
Diopside.....	5.-6.	2.9-3.5	Sphene (Titanite)....	5.-5.5	3.4-3.56
Emerald.....	7.5-8.	2.67-2.75	Sunstone.....	6.-7.	2.56-2.72
Epidote.....	6.-7	3.32-3.5	Thomsonite.....	5.-6.	2.31-2.35
Essonite.....	6.5	3.5-3.56	Thulite.....	6.-6.5	3.25-3.37
Euclase.....	7.5	3.1	Topaz (Precious).....	8.	3.4-3.6
Fluor Spar.....	4.	3.1-3.2	Tourmaline.....	7.-7.5	3.-3.1
Garnet.....	5.-8	3.15-4.3	Turquoise.....	6.	2.6-2.8
Grossularite.....	6.	3.3-3.6	Uvarovite (Green Garnet).....	7.5	3.41-3.52
Hematite.....	5.6-6.5	4.2-5.3	Vesuvianite.....	7.	3.35-3.47
			Zircon.....	7.5	4.71

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SYNTHETIC GEMS

HYDROFLUORIC ACID TEST

While it is possible to fuse small particles of true Rubies to form a larger stone, this process is not generally in use. The less expensive method of melting powdered alumina is the commercial way in which partially all of the synthetic or so-called reconstructed Rubies are made.

The term "reconstructed" is therefore generally a misnomer when applied to the alumina or corundum glass gems which are sold as "reconstructed" but should be sold under the name of "synthetic" stones.

While all reconstructed and scientific stones can be readily distinguished from genuine by experts, some of these imitations are extremely good and occupy a class by themselves by reason of their hardness and dichroic qualities.

So-called reconstructed or synthetic Emeralds have thus far proven to be doublets or glass.

HYDROFLUORIC OR WHITE ACID is a simple test for glass---and as it does not affect gold it is possible to immerse a mounted piece of jewelry in this acid for a minute or two---ordinarily, however, a drop of the acid placed on the stone under examination will suffice to make the test.

Diamonds, Rubies, Sapphires, Emeralds, Precious Topazes, Chrysoberyls, Zircons, Tourmalines, Aquamarines, Beryls and scientific stones made from alumina (Synthetic Rubies and Sapphires) are not affected by this acid.

Amethysts, Topazes (quartz) and Peridots are slightly etched, while glass is quickly attacked, and if not removed from the acid will be deeply etched and finally eaten away.

While this is a simple test, great care should be taken in handling the acid; rubber gloves or rubber finger cots should be used, as the acid is apt to cause painful sores; its fumes are also to be avoided.

CORUNDUM

This many colored mineral, composed of nearly pure alumina, produces gems which in some cases are more valuable even than diamonds. The ruby, sapphire, Oriental emerald, Oriental topaz, Oriental amethyst, Oriental aquamarine, Oriental chrysolite, Oriental hyacinth, star ruby, star sapphire, star topaz, and ruby and sapphire cat's eye are all corundums of different colors. The ruby is a red sapphire, and the Oriental topaz a yellow sapphire, while the Oriental emerald is a green sapphire, etc., etc.

In hardness corundum ranks next to the diamond being No. 9 in Moh's scale.

The specific gravity is 3.9 to 4.1, the crystallization rhombohedral, and cleavage basal, the crystals breaking across the prism with nearly a flat surface.

In lustre, the corundum is vitreous, its refraction double but not to a high degree, and it is susceptible of electricity by friction, which the polished specimens especially retain for a considerable time.

Corundum is pleochroic in the deeply colored varieties but dichroism is difficult to see in the paler colors.

Corundum is not acted upon by acids and is infusible alone, but in combination with a flux it melts with difficulty into a clear glass.

Precious corundum consists of over 90% alumina with small quantities of silica and chromic, ferric or titanio oxides.

Thus it will be seen that corundum is composed almost wholly of alumina, --one of the constituents of common clay, which, when colored by traces of metallic oxides, produces a greater variety of precious stones of a high rank than any other mineral.

This very ordinary material, composed of nearly pure silica, presents a fine white to cream color and is found in various localities. The silica is composed of minute grains, which are often seen under the microscope. The grains are of various sizes, but are generally between 1 and 2 microns in diameter. The grains are often seen to be surrounded by a thin layer of water, which is held in place by the surface tension of the water. This water is often seen to be held in place by the surface tension of the water.

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RUBY

The red sapphire or ruby is the most valuable of the corundum family, and when found of a good color, pure and brilliant, and in sizes of one carat and larger, is often more valuable than a fine diamond of the same size.

Fine large rubies are very rare, and when a fine stone from four to five carats is offered for sale, the price mounts into the thousands.

The color varies from the lightest rose tint to the deepest carmine; that color, however, which has the greatest value is known in commerce as pigeon's blood, and is the color of arterial blood, or of the very centre of the red ray of the solar spectrum.

The imperfections in rubies, as in all corundums, consists largely of clouds, milky spots, and cracks. A perfect ruby is rarely met with, and a stone possessing brilliancy and the true color, even if slightly imperfect is considered more valuable than a perfect ruby of an inferior color.

Rubies are found in Burma, Siam, Ceylon, Afghanistan, India, Brazil, Australia and the United States.

Where rubies and sapphires are met with it is said that gold is almost sure to be present.

Ruby spinels, garnets, hyacinths, red quartz, burnt Brazilian or rose topazes and red tourmalines are sometimes passed off for rubies.

The true ruby will scratch all of these stones readily, the spinel is lighter in specific gravity, and has generally a slight tinge of yellow, even in the more pronounced red specimens.

The ruby will turn green under the flames of a blow pipe, but when cooled off resumes its original color.

Garnet and topaz are easily scratched by the ruby, hyacinth (zircon) is heavier, and quartz and tourmaline lighter than the ruby.

Natural & Synthetic

Many years ago chemists succeeded in producing minute crystals of rubies and sapphires which under the microscope presented the true crystallization of corundum and upon being tested proved to be of the same hardness as rubies; but these specimens were small and had no commercial value.

The next step in imitating the ruby was the so-called process of reconstruction. Small particles of genuine rubies were placed under a powerful flame and fused together; this fused mass was then cut and polished and became commercially known as the reconstructed ruby.

The present corundum imitation is a synthetic product formed by melting powdered alumina and adding a metallic oxide to give it the desired red, pink, yellow or blue or other color.

This synthetic imitation costs much less to produce and is generally better than the "reconstructed" stone, therefore it is safe to say the practically all the artificial corundum imitations now on the market are produced by the synthetic method and the term "reconstructed" is generally inaccurate and misleading.

Corundum artificial stones can be detected by experts; most of them readily, but occasionally fine specimens require close microscopic examination and exact knowledge to determine what they are.

Synthetic rubies and sapphires have a distinct and valuable use in the jewelers art--they replace the garnet or fire doublets which have hitherto been the principal durable imitation colored stones, they cannot however materially affect the demand for genuine stones any more than the most perfect imitation pearls prevent the sales of costly genuine pearl necklaces to those who have the means to purchase the real gems.

Many perfect copies of the Sistine Madonna have been made by good artists--the original is priceless, the copies at the most are worth a few hundred dollars--this is the relation of a gem made in nature's laboratory to one produced by the chemist.

SAPPHIRE

Blue corundum, ranging in color from the lightest blue to deep blackish blue is the same stone as the ruby, the only difference being in the color.

The choicest color is the soft velvety blue, approaching the corn-flower in shade and exhibiting that color vividly by artificial as well as by natural light.

The deeper-colored stones are known as male, and the light-colored ones as female sapphires.

Although choice sapphires are uncommon, a greater quantity of good large stones are to be had than of rubies, and consequently the price of a large sapphire does not advance in the same proportion as the price of a large ruby.

Mineralogically all sapphires are practically alike but different localities produce distinctive colored stones which are known as Cashmere, Burma, Ceylon, Montana or Australian sapphires.

CASHMERE (Sapphires)

The Cashmere or Kashmir sapphire occurs in India in the State of Kashmir in the Himalaya Mountains.

This variety is generally known as cornflower blue and is noted for its vivid color and velvety appearance shading from light to fairly dark blue without the slightest trace of black or green.

Cashmere sapphires are usually full of silk and other imperfections and the color is sometimes contained in a small part of the stone--consequently clean well proportioned stones of this variety are rarely obtainable in important sizes.

BURMA (Sapphires)

"Burma" or "Oriental" sapphire is the trade name for the darker variety of blue corundum which is supposed to come from Burma but most of which actually comes from the neighboring country of Siam.

It is true that a certain proportion of the darkest "Oriental" sapphires come from "Burma" but the largest quantity as well as the finest stones are found in the Bo Pie Rin mines in Battambang, Siam.

CEYLON (Sapphires)

The Island of Ceylon produces the lighter colored sapphires ranging from delicate pale gray blue to purplish blue and occurring in larger sizes than sapphires generally found in other localities.

MONTANA (Sapphires)

The beautiful electric blue sapphires found in Yogo Gulch, Fergus County, Montana, have gradually come into public favor and while most of these stones are cut in Europe the bulk of them are returned to and sold in the United States.

Montana produces large quantities of clean, uniformly colored blue corundum rough, suitable for small and medium sized stones--cut stones above two carats are unusual but five carat stones are rare, the color is so even however, that this variety of sapphire is especially adapted for work that requires a number of evenly matched stones.

When a person is looking at a light source, the light enters the eye through the cornea and is focused on the retina. The eye's lens is responsible for focusing the light. The eye's lens is made of two parts, the cornea and the lens. The cornea is the front part of the eye, and the lens is the back part. The lens is made of a transparent material and is surrounded by a fluid called vitreous humor. The lens is responsible for focusing the light on the retina. The retina is the back part of the eye, and it is responsible for converting the light into electrical signals that the brain can understand. The brain then sends these signals to the visual cortex, which is responsible for processing the information and creating a visual image.

CHAPTER

(continued)

The human eye is a complex organ that is capable of seeing a wide range of colors and shapes. The eye's lens is responsible for focusing the light on the retina. The retina is the back part of the eye, and it is responsible for converting the light into electrical signals that the brain can understand. The brain then sends these signals to the visual cortex, which is responsible for processing the information and creating a visual image. The eye's lens is made of a transparent material and is surrounded by a fluid called vitreous humor. The lens is responsible for focusing the light on the retina. The retina is the back part of the eye, and it is responsible for converting the light into electrical signals that the brain can understand. The brain then sends these signals to the visual cortex, which is responsible for processing the information and creating a visual image.

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CHAPTER

(continued)

The human eye is a complex organ that is capable of seeing a wide range of colors and shapes. The eye's lens is responsible for focusing the light on the retina. The retina is the back part of the eye, and it is responsible for converting the light into electrical signals that the brain can understand. The brain then sends these signals to the visual cortex, which is responsible for processing the information and creating a visual image. The eye's lens is made of a transparent material and is surrounded by a fluid called vitreous humor. The lens is responsible for focusing the light on the retina. The retina is the back part of the eye, and it is responsible for converting the light into electrical signals that the brain can understand. The brain then sends these signals to the visual cortex, which is responsible for processing the information and creating a visual image.

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AUSTRALIAN (Sapphires)

Australian sapphires are found in Queensland, South Australia, Victoria and New South Wales.

A fairly large quantity of greenish blue and blackish blue stones are produced but the gem material is generally small and the distinctly blue stones scarce.

Fine blue Australian sapphires are found however and they are commercially as valuable as sapphires of like color coming from the Siam or Burma mines.

Through "Trade" usage the otherwise geographical terms Burma, Ceylon, Cashmere etc. have become indicative of color and quality rather than place of mining. Hence a dark bright sapphire although actually mined in Ceylon might properly be designated "Burma".

FANCY SAPPHIRES

The Oriental emerald or green sapphire, does not approach the beryl or true emerald, in depth of color, but because of its superior hardness and brilliancy it is one of the valuable green gems. The Oriental amethyst or purple sapphire, sometimes reflects a red color by artificial light and is valued highly as a gem stone; the common amethyst is softer, less brilliant, and loses by artificial light.

The various other colored sapphires, such as yellow or Oriental topaz, light green or Oriental aquamarine, greenish-yellow or Oriental chrysolite, and aurora-red or Oriental hyacinth, are all valuable as gem stones when they are pure, well cut, and have pronounced colors--in fact, the name Oriental is given to distinguish the corundums from the less valuable minerals of the same colors which they resemble, but which they greatly surpass in beauty and value because of their brilliancy and superior hardness.

STAR SAPPHIRES & STAR RUBIES

Asterias or star stones are corundums of three different colors; the star sapphire proper is grayish blue to dark blue, the star ruby is pink to red and the star topaz yellow.

These stones are cut cabochon or convex, and display under the rays of the sun, or when exposed to one candle or other artificial light, a beautiful star with six points.

This star is produced by foreign substances in the corundum, and the lapidary brings about the regular effect by cutting a pointed carbuncle so that the centre of the star begins at the apex, and the six bright stripes radiate to the base of the stone.

The bright lines of the star following the light move over the surface of the stone and produce a remarkable effect. These stones are amongst the most wonderful of mineral productions, and good specimens are valuable.

As a rule, the most distinct stars are found in the grey variety, while the sharpness of the star diminishes more or less in the blue gems. In fact, it seems almost a natural law that the stones of the deepest blue have the least distinct stars. But a single light, or preferably the sun's rays will often make even a weak star "show up" quite distinctly.

SPINEL

It was only during the past century that gem dealers made a distinction between the minerals spinel and corundum.

The composition of the spinel was discovered towards the end of the eighteenth century, and was found to be about seventy per cent. alumina, twenty-five per cent. magnesia, and small parts of oxide of chrome, silica, and protoxide of iron.

Up to that time, red spinels had always been confounded with rubies, and many celebrated so-called rubies have been shown to be spinels by modern mineralogists.

This beautiful mineral is found in many colors, from pink to rose-red, carmine, cochineal, blood-red, hyacinth, pale to dark blue, violet and indigo blue, grass-green to blackish green, and sometimes colorless. There is also a black variety called pleonaste or ceylonite. Spinel crystallize in octahedrons and their modifications, the fracture is conchoidal, specific gravity 3.5 to 3.6, and hardness No. 8 in Moh's scale; only the diamond, corundum and chrysoberyl will scratch the spinel.

Its refraction is single, the lustre highly vitreous, and it does not easily acquire electricity.

Acids do not attack the spinel, nor has the blow-pipe any effect on this mineral, except to change the red to a brownish or colorless state, but the original color returns when the stone cools.

Flawed or imperfect stones are liable to crack or split if heated too much. With borax or salt of phosphorus the spinel melts into a colorless or green-tinted glass.

Spinel is found in clay, and in the sands of rivers, in Burma, Afghanistan, Siam, Ceylon, Brazil, Australia and North America.

The red spinel, and especially those tints which approach the red corundum or true ruby in color, are the most valuable, and are known as ruby spinels.

Very fine specimens of ruby spinels of one carat and larger are uncommon and command good prices.

Rose-colored spinels are known as balas-rubies; pale-blue spinels as sapphirines; and the hyacinth-red, yellowish-red and orange-yellow spinels are called rubicelles.

All these different colored spinels, if pure and of great brilliancy, are valuable as gem stones, being only surpassed in hardness and brilliancy by the diamond and corundums.

The white spinel, which is seldom found, is sometimes confounded with the diamond, having the same specific gravity and single refraction, but as it lacks the fire and is easily scratched by the diamond, the danger of mistaking one for the other is slight. Burnt amethyst, which often resembles the spinel, is lighter and softer, while burnt precious topaz, although it is identical with the spinel in hardness, is somewhat lighter and possesses remarkable electric powers, becoming electric by either rubbing, heating or pressure, and retaining electricity for upwards of twenty-four hours.

The zircon is easily distinguished from the spinel because of its much greater specific gravity. It is also doubly refractive and softer.

Garnets are softer, lack the play of color and brilliancy, and fuse easily into a light brown or black glass.

BERYL

The beryl is a mineral belonging to the primitive formation, and is found in quartz veins and granite.

It crystallizes in six-sided prisms and is composed largely of silica, the third most common of earth's productions. The beryl is 7.5 to 8. in hardness, scratching quartz, but is scratched by precious topaz.

The specific gravity is 2.67 to 2.73 making it one of the light gem minerals. Its lustre is vitreous and refraction double to a slight degree; its cleavage is imperfectly basal, and it becomes electric by rubbing.

Acids do not attack the beryl, but it melts with borax and is soluble in salts of phosphorus.

This stone is found in various colors, grass-green, pale-green, light-blue, greenish-blue, greenish-yellow, yellow, golden-yellow, pink and rose-red.

The most important of these colors is the grass-green, which forms a separate division of the beryl family, and is known as the emerald.

The second and less valuable division of the beryl family comprises the following colors:

Clear sky-blue, called by lapidaries aquamarine; greenish-blue, known as Siberian aquamarine; and a greenish-yellow variety, called aquamarine chrysolite; light to dark yellow called yellow beryl and golden beryl, and light pink to dark rose pink called morganite.

These are usually very brilliant, and especially by artificial light, in which respect the beryl is superior to many of the more valuable gem stones.

Large beryls of the aquamarine variety have been found in Brazil in recent years and many thousands of carats of beautiful gems have been cut from this material. The largest of these gem crystals was found at Marambaya several years ago and weighed nearly 250 pounds.

Beryls of very large size have been found in the United States; one crystal found in New Hampshire has been estimated to weigh over two tones; these specimens were however useless for gem cutting.

Many fine aquamarines have been found at the Wiseman Mine in North Carolina; these stones though small are extremely fine in quality and deeper in color than the Brazilian. Golden yellow beryls have been found in New Hampshire and Connecticut which compare favorably with the best of their kind.

Several years ago a deposit of light pink and rose red beryl was found in Madagascar and most of the best rough was sent to the United States where the stone received the name of morganite.

The body is a slender, tapering form, the head is small and pointed, the tail is long and thin, the body is covered with a fine, silken hair, the color is a pale yellow, the body is very soft and pliable, the body is very light and airy, the body is very smooth and glossy, the body is very strong and durable, the body is very beautiful and attractive, the body is very useful and practical, the body is very cheap and economical, the body is very easy to use and handle, the body is very safe and secure, the body is very reliable and trustworthy, the body is very honest and sincere, the body is very kind and gentle, the body is very loving and caring, the body is very helpful and supportive, the body is very generous and giving, the body is very patient and understanding, the body is very forgiving and merciful, the body is very wise and knowledgeable, the body is very brave and courageous, the body is very strong and powerful, the body is very fast and agile, the body is very flexible and adaptable, the body is very resilient and enduring, the body is very healthy and vibrant, the body is very happy and content, the body is very peaceful and calm, the body is very loving and caring, the body is very helpful and supportive, the body is very generous and giving, the body is very patient and understanding, the body is very forgiving and merciful, the body is very wise and knowledgeable, the body is very brave and courageous, the body is very strong and powerful, the body is very fast and agile, the body is very flexible and adaptable, the body is very resilient and enduring, the body is very healthy and vibrant, the body is very happy and content, the body is very peaceful and calm.

EMERALD

The emerald or green beryl is one of the most highly prized of the gem stones. Its magnificent color has rightly been compared to the color of the fresh grass in Spring, and in brilliancy this stone far exceeds all other green gems, excepting only the very rare grass-green corundum or green sapphire.

The emerald is said to be very soft when first withdrawn from the mine, but it hardens by exposure to the air.

A perfect emerald of fair size is a rarity, so that the saying "an emerald without a flaw" has passed into a proverb.

This stone is light compared to a diamond or sapphire, and an emerald of a given weight will therefore be about a third larger than a diamond and about 45% larger than a sapphire. The emerald is composed of:

Silica	68.50	Peroxide of iron	1.
Alumina	15.75	Lime	0.25
Beryllium	12.50	Oxide of chrome	0.30

And traces of magnesia, of lime, and of soda.

The vivid green color of the emerald is supposed to come from the oxide of chrome, as the other beryls do not contain chrome.

Emeralds are found in Columbia near Bogota, Egypt, Urals in Europe; Salzburg, Austria; Mt. Remarkable, South Australia; Norway and North America. Most of the finest come from the mines of the Muze, near Bogota, and the best stones used to be called Peruvian emeralds. During the conquest of Peru by the Spaniards, many very fine emeralds were destroyed by the invaders, who tested them by grinding and pounding, and concluded that the emeralds were worthless, because they were not as hard as the diamonds or sapphires.

In 1587, Joseph D'Acosta returned to Spain with two cases of emeralds, each case weighing one hundred pounds.

Green tourmaline sometimes passes for the emerald, but it is somewhat softer and considerably heavier,

Olivines or green garnets, if of a fine dark color, sometimes resemble the emerald, but they are much heavier than the emerald and have a fatty lustre. Green spinels are heavier and harder than emeralds.

CHRYSOBERYL

The name chrysoberyl is derived from two Greek words signifying golden-beryl. This name is well suited to the golden-yellow variety, but the chrysoberyl also includes many other colors: such as green, greenish-yellow, brownish-yellow, white, and dark-brown to black.

Three varieties of chrysoberyl are known as cat's-eyes, cymophanes, and alexandrites.

Chrysoberyl crystallizes in the trimetric or rhombic system; its cleavage is imperfect; fracture conchoidal; hardness 8.5 being the third hardest stone; specific gravity 3.65 to 3.8, and lustre vitreous to greasy.

The composition of the chrysoberyl is: alumina 80.2; glucina 19.8; with traces of protoxide of iron and oxides of lead and copper. Chrysoberyl is doubly refractive to a high degree and acquires positive electricity lasting several hours.

Transparent greenish-yellow chrysoberyls are sometimes called Oriental chrysolites; these, and the brownish-yellow stones are the gems most used in jewelry.

The chrysoberyl cat's-eye, or Ceylon cat's eye, is found in various shadings of yellow, brown, green, and sometimes nearly black. These stones are translucent to opaque, and have a bright band of light running through the centre: this band is nearly always white, and in fine specimens is sharply defined, not too wide, and is in the centre of the stone.

The chrysoberyl cat's-eye is always cut convex or cabochon shape, and as the stone is moved from side to side the band of light moves over its surface.

CYMOPHANE

The cymophane, or floating light, as the name denotes, is a cabochon cut chrysoberyl with a bright spot of light which seems to float over the surface as the stone is moved. This variety of chrysoberyl is rarely used in jewelry.

ALEXANDRITE

On the day that the Emperor Alexander II of Russia attained his majority the Ural chrysoberyl, of a dark-green color, was found in the emerald mines of Takowaja in the Catherine Mountains.

This wonderful stone is emerald-green to dark-green in color, with often a slight red tint, but by artificial light good specimens change from green to a beautiful columbine-red.

As the colors green and red are the national colors of Russia, and the date of discovery of this in Russia occurred on the Emperor's birthday, the name alexandrite was given to this variety of chrysoberyl.

The alexandrite is often found in large pieces, but is nearly always flawed and cracked. This is a much-sought-after gem stone, and fine specimens of from one to five carats command good prices. Up to the present time, however, gem alexandrites have been rare, the demand always exceeding the supply.

Cat's-eyes and cymophanes are found in Brazil in alluvial deposits of rivers, and consequently in rolled and rubbed masses.

Chrysoberyls are found in Brazil, Russia, Ceylon, Borneo and Pegu.

Chrysolites and precious topazes are sometimes passed off for chrysoberyls. The chrysolite is, however, lighter and softer, while the topaz becomes electric from heating, and is softer.

Quartz or Hungarian cat's-eyes, which are sometimes mistaken for chrysoberyl or Oriental cat's eyes, have a specific gravity of about 2.65 hardness of 6 to 6.5

They lack the bright, hard polish of the chrysoberyl cat's eye, and there should be no difficulty in discovering the difference between the hard gem and the inferior stone.

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CONCLUSION

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REFERENCES

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ZIRCON

The zircon, hyacinth, jacinth, or jargoon belong to the tetragonal system of crystallization. The cleavage is imperfect, fracture conchoidal, and specific gravity 4.4 to 4.7, the stone being much heavier than any other gem. Its hardness is 7.5, lustre vitreous to adamantine, and refraction double to a high degree.

The zircon is phosphorescent when heated; it is infusible under the blowpipe, but loses its color; and with borax it melts into a transparent glass. Sulphuric acid affects this gem after long maceration.

The composition of the zircon is: zirconia, 66.3, silica, 33.7; with a trace of oxide of iron.

Under the microscope, the texture of this gem presents a watery appearance, called by the French *ratine*, and which looks like a liqueur poured into water. This is a strong distinguishing point in the zircon.

The zircon, hyacinth, jargoon, and jacinth are the same gems but of different colors.

The blue, brown, violet, and green colors are known as zircons, the red as hyacinth, the yellow as jacinth, and the grayish-white and white as jargoons.

The jargoon has often been palmed off as a diamond because of its transparency and adamantine lustre. For many years this colorless variety was known as the *Matura diamond*.

The Blue Zircon is also known as *Starlite*.

The zircon is found in Ceylon, Germany, France, Bohemia, America, and in fact in nearly all parts of the earth, as many as 120 localities having been noted where specimens of the mineral have been discovered. The principal supply of gem stones however comes from Ceylon.

The zircon can be distinguished from the garnet by its peculiar diamond-like brilliancy and its specific gravity.

TURQUOISE

Turquoise is never found in crystals, but in reniform or stalactitic masses. The color varies from pea and apple-green to greenish-blue, sky-blue and dark blue.

The hardness of turquoise is 6., specific gravity 2.6 to 2.8, lustre waxy, and condition opaque to slightly translucent.

Before the reducing flame of the blow-pipe, turquoise does not melt, but becomes brown and colors the flame green. With borax and salts of phosphorus turquoise melts to a clear glass, while it is also soluble in hydrochloric acid. Oriental or mineral turquoise is composed of:

Alumina	47.45
Phosphoric acid	27.34
Water	18.18
Oxide of copper	2.02
Iron	1.10
Oxide of manganese ..	0.50
Phosphate of lime ...	3.41
Total	100.00

The best color is a clear deep sky-blue, and in the true turquoise this color improves by artificial light: imitation turquoises, however, lose their fine color under the same conditions.

The finest gem turquoises used to come from the northeastern part of Persia, between Nishapoor and Meshed. Here they were mined and partly cut, and then the Persian merchants carried them to Russia, where they were sold at the great annual fair of Nijni-Novgorod and in Moscow.

For the past twenty years great quantities of turquoise have been mined in New Mexico, Nevada, Arizona and California and the best of the New Mexican stones were guaranteed to keep their color and were marked with a trade mark (a ring) on the back.

Only a very small percentage of these stones changed color but unfortunately the Azure mines have ceased producing good stones and a revival of a good demand for turquoise will necessitate the discovery of new deposits.

Specimens are also found in Burmah, Khorassan, Thibet, China, Silesia, Saxony, and on the Isthmus of Suez. The stones from these places have, as a rule, but little value as the color generally fades or turns green from exposure to the light. The color of a faded turquoise can sometimes be temporarily restored by simply repolishing the stone.

Occidental or bone turquoise called new rock or odontolite, to distinguish them from the Persian or old rock stone, are of organic origin.

They are cut from the teeth of mammonths, mastodons, dinotheriums, etc., and have been found near the town of Simor, in Lower Languedoc, France.

These teeth, the enamel of which is nearly as hard as mineral turquoise, are probably colored by contact with the phosphate of iron and copper, which give them a dark-blue, light-blue, and bluish-green color. They are easily attacked by a file, and totally destroyed by nitric acid.

When heated, the fossil turquoise or odontolite gives an offensive odor, owing to the decomposition of animal matter.

The odontolite is lighter than the mineral turquoise, changes color by artificial light, loses color in distilled water and alcohol, and is translucent on the edges.

Fossil turquoise does not fade like the mineral turquoise, but by artificial light appears of a dirty grayish-blue.

Turquoise are sometimes artificially stained, this can be detected by applying a drop of ammonia to the back of the stone; if the color is artificial the ammonia will eat it off, leaving a green or whitish spot. Ammonia does not affect the color of the genuine turquoise. So-called "reconstructed" turquoise are very close imitations of the real, but are easily distinguished, as they change rapidly to a deeper blue when immersed in water, and while wet the surface of the stone shows minute cracks in every direction. These stones become softer through soaking in water or alcohol. The original color, however, returns when the stone is dry, but the cracks often remain in faint outline.

TOURMALINE

Tourmaline or precious schorl is known under many different names, and no other mineral has such a suite of colors.

The colorless variety is known as achroite; the red, as rubellite or siberite; the blue, indicolite or Brazilian sapphire; the green, Brazilian emerald; and the yellowish-green, Ceylon chrysolite or Ceylon peridot. Besides the above colors and their shadings, the tourmaline occurs in black and brown.

The crystallization is obtuse rhomboid, and generally forms six, nine, and twelve-sided prisms.

Some of the crystals are very large, specimens over eight inches long having been mined.

Tourmaline crystals are remarkable for their varied and beautiful groupings of colors. Some are internally blue or brown, surrounded by a bright carmine red or dull yellow; others are red internally and are enveloped by a green exterior; crystals are sometimes pink at the summit and light green at the base, or crimson tipped with black, or white at one end shading into green and finally into red at the other end. The hardness of tourmaline is 7 to 7.5, specific gravity 3 to 3.1 and lustre vitreous.

Tourmaline becomes decidedly electric by heating or rubbing, and will readily attract small pieces of paper and other small objects. Rubellite or red tourmaline is composed of:

Silica	42.13
Alumina	36.43
Boracic acid	5.74
Oxide of manganese	6.32
Lime	1.20
Potash	2.41
Lithia	2.04

Green tourmaline is composed of:

Silica	40.
Alumina	39.16
Lithia and potash	3.59
Protoxide of iron	5.96
Protoxide of manganese	2.14
Boracic acid	4.59
Volatile matter	1.58

Tourmaline possesses double refraction to a high degree, and its power of polarizing light is so great that, cut into slices, it is used in the polariscope for analyzing other minerals.

If two slices of tourmaline, cut parallel to their axis, be laid one on the other in one direction, both are transparent; if laid in another direction they become opaque, and if a doubly refracting crystal be placed between the two plates of tourmaline, the part covered by the crystal is transparent while the other is opaque.

TOXICITY

The toxicity of a substance is determined by the amount of the substance which produces a given effect in a given time.

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TOURMALINE (Continued)

Tourmaline melts with borax into a transparent glass, rubellite turns white, and indicolite and green tourmalines turn black, under the blow-pipe.

Tourmalines may be distinguished from other gems by their specific gravity, but principally by their property of assuming polaric electricity after being heated, one end becoming positive and the other negative.

The history of the discovery of tourmaline and its electric property is a curious one.

On a warm summer day, early in the eighteenth century, some children were playing in a courtyard in Amsterdam. Amongst their playthings were some precious stones which the Dutch navigators had brought from Ceylon. Some of the stones seemed to be possessed of the strange power of attracting and repelling small bits of straw, ashes, and other light substances. The little ones called their parents to witness this strange phenomenon, and the stolid Dutch lapidaries, themselves puzzled at the sight, called the stones aschentreckers or ash-drawers.

A number of years afterwards, careful experiments disclosed the wonderful electric powers of the aschentreckers or tourmalines. Purple, green and blue tourmalines are found in Brazil. In Ceylon the stones are found in gravel beds. Rubellites or siberites are found in Siberia.

Tourmalines are also found in Moravia, the island of Elba, Sweden, Burmah, Tyrol, Canada, and the United States.

The first tourmaline deposits known in the United States were discovered at Paris, Maine, in 1820. Another wonderful deposit was found at Mt. Apatite in Maine in 1882, and up to the present time the finest tourmaline crystals have been discovered in the United States.

Most of the red and pink tourmaline sold in this country is found in California where important deposits of this beautiful mineral have been successfully worked for a number of years. Good specimens of red, blue and green tourmalines command good prices while the inferior grades are more plentiful and comparatively cheap.

The first of these is the fact that the earth is not a homogeneous body, but is composed of various materials, each of which has its own specific properties.

The second is the fact that the earth is not a perfect sphere, but is flattened at the poles and bulged out at the equator.

The third is the fact that the earth is not a solid body, but is composed of various layers, each of which has its own specific properties.

The fourth is the fact that the earth is not a static body, but is constantly changing. The surface of the earth is constantly being reshaped by the forces of erosion and deposition. The interior of the earth is constantly being reshaped by the forces of heat and pressure.

The fifth is the fact that the earth is not a uniform body, but is composed of various regions, each of which has its own specific properties.

The sixth is the fact that the earth is not a simple body, but is a complex body, composed of many different parts, each of which has its own specific properties.

The seventh is the fact that the earth is not a static body, but is constantly changing. The surface of the earth is constantly being reshaped by the forces of erosion and deposition. The interior of the earth is constantly being reshaped by the forces of heat and pressure.

The eighth is the fact that the earth is not a uniform body, but is composed of various regions, each of which has its own specific properties.

CHRYSOLEITE AND PERIDOT

Chrysolite and peridot are members of the olivine group and only differ in color.

The chrysolite proper, or golden-stone as its Greek name signifies, is usually of a pale greenish yellow color, whereas the peridot is light to darkish olive green often shading to a greenish brown.

The olivine of commerce is a green garnet and is not a member of this group.

Chrysolite crystallizes in the rhombic system, is transparent to translucent 6.5 to 7. in hardness and 3.3 to 3.5 in specific gravity. Its cleavage is distinct, fracture conchoidal, refraction double and lustre vitreous to greasy.

This stone is easily affected by sulphuric acid. Chrysolite is composed of silica, magnesia and oxide of iron.

Fine large specimens of peridots are found on an island in the Red Sea said to belong to the Khedive of Egypt.

Small stones are found in Arizona and New Mexico, other localities are Burma and Queensland.

Peridots have the distinction of being the only precious stones that have literally dropped from heaven, as they have been found in meteorites.

Oriental chrysolite of commerce is true chrysoberyl and is harder and heavier than chrysolite, and so called Ceylon chrysolite is a greenish yellow tourmaline which is easily distinguished as it is harder and lighter than chrysolite.

SPHENE

Sphene or Titanite seems to have been unknown to the earlier writers on precious stones and even some of the recent German authorities show a lack of information in regard to this beautiful gem, as they speak of it as an inferior soft stone which has therefore but little value and is sometimes mixed with chrysolites, chrysoberyls, etc., by unscrupulous dealers.

Good specimens of sphene are extremely rare and when found command prices equal to the finest olivines. Gem sphenes have been sold at prices approximating rubies and sapphires of the same sizes. Sphene or Titanite is silicate of titanium and lime as follows:

Silica	31.
Titanium dioxide	41.
Lime	27.
Ferrous oxide	<u>1.</u>
Total	100.

Sphenes are brittle and soft, hence they are not so suitable for rings as for scarf pins, brooches and necklaces--the hardness being but 5. to 5.5.

They are highly doubly refractive and have the specific gravity of 3.40-3.56.

Their lustre is adamantine to resinous and the darker stones display a vivid dichroism.

While the names seem to be interchangeable the transparent gem variety of this mineral is generally known as sphene and the opaque variety as titanite.

The yellow and reddish yellow colors are the ones most sought after, as they often show the play of the fire opal. Good cutting crystals have been found in Switzerland and the United States and there are many other localities where titanite is found.

GARNET

Garnets belong to the isometric system of crystallization and although they are uniformly singly refracting and monochroic they vary greatly in specific gravity and hardness.

Much confusion exists in the trade in determining some of the varieties of this important gem mineral because names are sometimes applied to garnets which properly belong solely to other gems. For instance Arizona ruby, American ruby, Adelaide ruby, Cape ruby, Ceylon Ruby and Colorado ruby are not rubies at all but simply ruby red garnets.

Other garnets are improperly sold as hyacinth or jacinth, notwithstanding the fact that true hyacinth is zircon, a distinctly different gem mineral. The beautiful olivine of commerce which so nearly approaches the emerald in color and surpasses it in brilliancy is not the gem scientifically known as olivine but is the Bobrovka demantoid or soft green garnet; these stones have also been called Uralian emerald and Siberian chrysolite but the name olivine is now universally used in commerce to denote this variety of garnet.

The following is a list of names given to garnets including different spellings of the same name as Almandine and Almandite, Hessonite and Essonite, etc.

Almandine	Cape Ruby	Hessonite	Romanzovite
Almandite	Ceylon Ruby	Hyacinth	Spessartite
Andradite	Ceylon Hyacinth	Jacinth	Spessartine
Arizona Garnet	Cinnamon Stone	Madagascar Garnet	Syriam Garnet
Arizona Ruby	Colorado Ruby	Melanite	Syrian Garnet
American Ruby	Demantoid	Olivine	Siberian Chrysolite
Adelaide Ruby	Essonite	Oriental Garnet	Succinite
Bohemian Garnet	False Hyacinth	Ouvarovite	Topazolite
Bobrovka Garnet	Fashoda Garnet	Precious Garnet	Uralian Emerald
Carbuncle	Grossularite	Pyrope	Uvarovite
Cape Garnet	Gooseberry Stone	Rhodolite	Vermeille

Dana classifies the garnet group as follows:-

- | | | |
|---|---|-------------------------|
| A. Grossularite or Calcium Aluminium Garnet. |) | |
| B. Pyrope or Magnesium Aluminium Garnet. |) | |
| C. Almandite or Iron Aluminium Garnet. |) | Aluminium Garnet |
| D. Spessartite or Manganese Aluminium Garnet. |) | |
| E. Andradite or Calcium Iron Garnet. | - | Iron Garnet |
| F. Uvarovite or Calcium Chromium Garnet. | - | Calcium Chromium Garnet |

A. GROSSULARITE

Cinnamon stone (hessonite or essonite) grossularite (gooseberry stone) succinite and romanovite, belong to this variety of aluminium garnet. The cinnamon stone is of a reddish golden color shading from hyacinth red to orange and yellow: viewed at arms length the color sometimes appears red while the same stone held close to the eye takes on a yellow tinge.

Under a strong pocket lens the structure of the stone looks granular and lacks limpidity.

The brilliancy of this variety of garnet improves by artificial light.

The darker stones are usually called hyacinths, the lighter ones cinnamon stones.

Cinnamon stone is composed of:	(Silica	40.
	(Alumina	22.7
	(Lime	37.3
		100.

Gravities being to the lowest degree of crystallization and although they are uniformly slightly refracting and anisotropic they vary greatly in specific gravity and hardness.

These minerals which in the form of detrital grains of the various sizes of this important group which are scattered about in various rocks, are generally found in the form of grains. The grains are usually very small, and the grains are usually very small, and the grains are usually very small.

These grains are generally found in the form of grains, and the grains are usually very small, and the grains are usually very small, and the grains are usually very small. The grains are usually very small, and the grains are usually very small, and the grains are usually very small.

The following is a list of some of the grains which are found in the form of grains, and the grains are usually very small, and the grains are usually very small, and the grains are usually very small.

Quartz	Orthoclase	Albite	Microcline
Plagioclase	Albite	Microcline	Orthoclase
Albite	Microcline	Orthoclase	Plagioclase
Microcline	Orthoclase	Plagioclase	Albite
Orthoclase	Plagioclase	Albite	Microcline
Plagioclase	Albite	Microcline	Orthoclase
Albite	Microcline	Orthoclase	Plagioclase
Microcline	Orthoclase	Plagioclase	Albite
Orthoclase	Plagioclase	Albite	Microcline
Plagioclase	Albite	Microcline	Orthoclase
Albite	Microcline	Orthoclase	Plagioclase
Microcline	Orthoclase	Plagioclase	Albite

These grains are found in the form of grains, and the grains are usually very small, and the grains are usually very small, and the grains are usually very small. The grains are usually very small, and the grains are usually very small, and the grains are usually very small.

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GARNET (Continued)

A. GROSSULARITE (Continued)

Specific gravity 3.55 to 3.70. Hardness $7\frac{1}{4}$ or slightly above quartz and refraction 1.745.

Grossularite or gooseberry stone is the greenish variety of this group but this stone as well as succinite the amber colored, and romanzovite the brown varieties are not commercially important. Hyacinth colored cinnamon stone is often confused with true hyacinth or zircon. It is however an easy matter to distinguish the former from the latter. The specific gravity of cinnamon stone is 3.55 to 3.70 therefore it is much lighter than true hyacinth (zircon) which is 4.6 to 4.7. Cinnamon stone is also somewhat softer being $7\frac{1}{4}$ against true hyacinth $7\frac{1}{2}$. Cinnamon stone has a glassy lustre whereas zircon possesses adamantine or diamond lustre.

Hyacinth colored spinels are more difficult to distinguish from garnets as they have about the same specific gravity as the cinnamon stones though they are harder--a close examination of the structure of the cinnamon stone with a strong lens will however usually determine the question of classification.

These stones are found in Ceylon and in San Diego County, California; a few small stones are found in Europe.

B. PYROPE

Pyrope, or magnesium aluminium garnet takes its name from the Greek word "pyros" meaning "fire like".

The color of this garnet is generally dark blood red with a yellowish tinge--it is sometimes hyacinth red and occasionally brownish red. The brownish colored pyrope, in fact all brownish colored garnet is also known as vermeille.

Pyrope is composed of:	(Silica	44.8
	(Alumina	25.4
	(Magnesia	29.8
		100.

Specific Gravity:	-	-	-	-	3.69 to 3.78
Hardness	-	-	-	-	$7\frac{1}{4}$ to $7\frac{1}{2}$
Refraction	-	-	-	-	1.79

Pyrope is largely found in Bohemia where the garnet bearing area covers about 40 square miles. Most of the stones are very small but are well adapted to be cut into roses which form the bulk of the stones used in the low grade, flimsy, but effective gold garnet jewelry which has been sold in every part of the world.

It is stated that at the time this industry was at its zenith thousands of people were employed in finding the rough stones--cutting them and making the garnet jewelry.

The United States produces some fine specimens of pyrope which are known as American, Arizona or Colorado rubies. These stones are found in Arizona, Southern Colorado, Utah and New Mexico and occasionally in North Carolina. A fine dark red pyrope somewhat resembling the almandine in color is found associated with diamonds in South Africa. This variety is called Cape Ruby. Another dark red (most brownish red) pyrope has been found during the past few years in German East Africa. This variety produces large pieces of rough and is known as Fashoda garnet. It is somewhat heavier than Bohemian or American pyrope and two specimens of rough each weighing about forty metric carats, we found to have the following specific gravity.

Dark red 3.92

Pinkish red 3.85

GARNET (Continued)

C. ALMANDITE

Almandine, almandite, the carbunculus of the ancients, oriental garnet, precious garnet, Syriam garnet, Syrian garnet, Ceylon ruby and Adelaide ruby are some of the names of this important iron aluminium member of the garnet family.

Almandite is composed of:	Silica	36.2
	Alumina	20.5
	Iron Protoxide	43.3
		<u>100.</u>

Specific gravity 3.9 to 4.2 Hardness $7\frac{1}{2}$ Refraction 1.81

Colors vary from reddish violet to brownish red and from scarlet and crimson to deep red.

Unlike some other garnets the almandine becomes less brilliant and loses some of its beauty by artificial light.

These stones are found in Ceylon, India, Brazil, Uruguay, United States, Greenland, German East Africa and Australia.

When the Australian stones were discovered it was thought that the ruby red almandine were genuine rubies and many mining companies were formed to exploit the new gem find.

The finest of the violet garnets have been known as Syrian garnets--named after Siriam the chief city of Pegu now Burma, but it is doubtful if almandine garnets were ever found there although this ancient capital was probably an important market for the sale of these stones.

RHODOLITE

Rhodolite is a beautiful rose pink garnet found in Cowee Valley, North Carolina and named for its resemblance to the color of the rhododendron and rose.

According to Pratt and Lewis this variety of garnet is composed of two parts pyrope and one part almandite.

The specific gravity of a pale rose piece is given as 3.83.

The colors range from pale rose pink to dark rose pink and some have a purplish cast.

Large pieces are rare--in fact the Cowee Valley rhodolite seems to have given out.

Beautiful garnets have lately come into the market from Madagascar ranging in colors from light rose pink to dark brownish pink and from yellowish to brownish red--some of these stones seem to be as beautiful as rhodolites while others resemble the cinnamon stone.

The specific gravity of four specimens of rough and cut varies from 3.79 to 3.87 this being a density between pyrope and almandite.

D. SPESSARTITE

Spessartite or spessartine is a somewhat rare manganese aluminium garnet resembling the cinnamon stone in color but being more beautiful and easily distinguished because of its greater density.

Spessartite is composed of:	Silica	36.4
	Alumina	20.6
	Manganese Protoxide	43.
		<u>100.</u>
	- 20 -	

GARNET (Continued)

D. SPESSARTITE (Continued)

Specific gravity 4.14

Hardness $7\frac{1}{2}$

Refraction 1.81

These stones were found associated with amazonite and other minerals at Amelia Court House, Virginia but that source of supply has been cut off for many years. Fine specimens are sometimes found in Ceylon and small stones are reported as having been found in Nevada.

E. ANDRADITE

Andradite or iron garnet, which includes demantoid, topazolite and black garnet, named after the Portugues mineralogist d'andrada; is interesting to the jeweler principally because of the wonderful green variety found besides the Bobrovka stream in the Sissersk district on the western side of the Ural Mountains.

This garnet, sometimes called Uralian emerald, is mineralogically known as demantoid because of its adamantine or diamond lustre, but is universally called olivine by the trade.

True olivine or chrysolite is on the other hand generally known as peridot and occasionally as chrysolite where the color is very light and has a yellowish tinge.

The confusion of these names is so deeply rooted that most dealers, and even some eminent writers on gems do not seem to realize that the stone commercially called olivine is a soft green garnet while the mineralogically true olivine is always bought and sold as peridot or chrysolite.

Demantoid (olivine garnet) varies in color from a deep olive tinted emerald green to brownish or yellowish green. The emerald green variety contains a small amount of chromium.

	(Silica	35.5
Demantoid is composed of:	(Iron sesquioxide	31.5
	(Lime	33.
		100.

Specific gravity: - - 3.83 to 3.85

Hardness - - - - 6. to $6\frac{1}{2}$

Refraction - - - 1.89

Although the softest of the garnet family these stones are highly refractive and increase in brilliancy and beauty under artificial light.

Fine dark green demantoids while not very plentiful in small sizes are rarely found large enough to cut stones weighing as much as one carat.

The topazolite or yellow variety is seldom found large or clear enough to cut as a gem.

F. UVAROVITE

Uvarovite, Ouvarovite or calcium chromium garnet is a hard emerald green garnet of great beauty. Named after the Russian minister Count Uvarof. This variety of garnet is however so rare and the known clear specimens so small, that it does not possess commercial interest for the trade.

Uvarovite is composed of;	(Silica	35.9
	(chromium sesquioxide	30.6
	(Lime	33.5
		100.

Specific gravity: - - 3.41 to 3.52

Hardness - - - - 7.5 to 8.

Uvarovite is found in the Urals, in the western Himalayas, in Silesia and in the Pyrenees.

OPALS

Opal is not a crystalline body but is found in an amorphous state and indications are that this mineral was once in a fluid condition.

Opal is composed of about nine parts silica and one part water; it varies from 5.5 to 6.5 in hardness, has a specific gravity of 1.9 to 2.3; is glassy or waxy in lustre; has a refractive index of 1.44 to 1.46 and is slightly translucent to nearly transparent.

HUNGARIAN OPALS

Up to the early eighties the Czerwenitza mines near Kashan in Northern Hungary was the source from which the gem market obtained practically all of its precious or noble opals.

Hungarian opals were then commonly known as Oriental opals because of the mistaken idea in olden days that the finer stones were mined in the East--this belief was strengthened because Greek and Turkish merchants carried Hungarian opals to Constantinople from whence they were sent to Western Europe to be sold as Oriental stones. Many beautiful and some famous stones came from these mines; one rough piece in the Natural History Museum in Vienna weighing about 3000 carats.

BOULDER OPALS

Hungary ceased to be a factor as a producer of fine opals in the early eighties and about that time the first discovery of boulder opals was made in Queensland, New South Wales.

An English company was formed to work these fields but the material found was chiefly in thin veins running through a brown jaspideous iron stone which while suitable for cutting into cameos did not produce many gem stones suitable for mounting.

SANDSTONE OPALS

A little later Sandstone opal was discovered in West Queensland and this bright, clean, flashing yellowish material obtained a ready market.

The output of Queensland opal was considerable for some years when severe droughts came and the supply gradually fell away--these fields are reported to be active again but there are no stocks of fine Queensland opals in the market at present.

There is not a single specimen left but is found in an enormous
state and follows as one that this country has been in a state
of...

It is supposed to have been taken from the sea and was
found in the year 1841 in the month of June. It was found in the
state of...

THE SPECIES

It is the only species of the genus that has been found in
the state of...

The species is found in the state of... It is found in the
state of... It is found in the state of...

THE SPECIES

The species is found in the state of... It is found in the
state of...

The species is found in the state of... It is found in the
state of...

THE SPECIES

A small specimen of the species was found in the state of
the state of...

The species is found in the state of... It is found in the
state of...

OPALS (Continued)

WHITE CLIFFS OPALS

White Cliffs fields in New South Wales were discovered in 1889 and the miners flocked to these new mines where a steady supply of clean white opal free from matrix was obtainable.

This celebrated field produced gems equal in quality and color to the best of the old Hungarian stones and upwards of two and one-half millions of dollars of rough was obtained in the first ten years. Then the inevitable failure of opal production came and at present the output is small and irregular and the field almost deserted.

MEXICAN OPALS

Mexican Opals are more translucent than Hungarian or Australian opals and include the golden yellow, brownish red and fiery red fire opals which have also been found in Honduras and the Faroe Islands.

These fire opals are sometimes faceted like diamonds and other transparent gems.

The producing opal mines of Mexico are in the state of Queretaro and the stones found there are cut by native lapidaries in the towns of Queretaro and San Juan del Rio.

Some of these stones are cut with the matrix on the back which greatly enhances the play of color especially in the more transparent variety.

UNITED STATES OPALS

Opal has been found in the United States and some very fine specimens were found in Oregon but in such limited quantities that mining operations on a substantial scale did not pay.

The latest discoveries of opal in this country occurred in Virgin Valley, Humboldt County, Nevada, where the material obtained is associated with petrified wood and many of the specimens found are silicified or petrified limbs, twigs, bits of bark, etc.

This opal is mostly dark material with flashes of peacock colors and some of the specimen pieces are beautiful.

Nevada opal has a tendency to crack either while it is being cut or after the stone has left the lapidary's hands--it is contended however that a process of gradual drying or seasoning before cutting the rough will eliminate this drawback.

THE (Continued)

THE (Continued)

While little things in the world often seem to be
and the others think to them and then a single step is
often made that has been made by the world.

It is not that the world is not in a hurry and
in the heart of the world is not in a hurry and
half of the world is not in a hurry and
the world is not in a hurry and the world is not in a hurry.

THE (Continued)

There are many things in the world that are not
and the world is not in a hurry and the world is not in a hurry.

There are many things in the world that are not
and the world is not in a hurry and the world is not in a hurry.

The world is not in a hurry and the world is not in a hurry
and the world is not in a hurry and the world is not in a hurry.

There are many things in the world that are not
and the world is not in a hurry and the world is not in a hurry.

THE (Continued)

There are many things in the world that are not
and the world is not in a hurry and the world is not in a hurry.

The world is not in a hurry and the world is not in a hurry
and the world is not in a hurry and the world is not in a hurry.

There are many things in the world that are not
and the world is not in a hurry and the world is not in a hurry.

There are many things in the world that are not
and the world is not in a hurry and the world is not in a hurry.

BLACK OPALS

The most notable of opal discoveries occurred about 1902 at lightning Ridge at the head of Darling River in Northern New South Wales about 60 miles from the village of Walgett. Some men were digging post holes and thus accidentally uncovered the first black opals.

Few stones were sold during the first three years; then rough and cut stones were sent to Europe and the demand for fine specimens soon exceeded the supply.

At one time as many as three hundred miners were on the fields; now the Lightning Ridge product is following the Hungarian, Boulder, Sandstone and White Cliffs opals and the early exhaustion of this unique gem field is freely predicted by Australian opal experts.

In formation, Black Opal is identical with White Cliffs and is found in the softer sandstones, clays, kaolin and soapstone beneath a hard, siliceous capping.

The "true" Black variety is scarce and is confined to a small area; it runs in an erratic way, a few stones here and there, with long barren patches between. Strictly speaking there are no opal "mines" as the entire field belongs to the Government, and is open to all miners who pay a small fee and conform to the regulations.

"Black" opal almost seems a misnomer, for while some of the stones are actually black and most of them have a dark body or background, they are really a wonderful flashing changing mass of color. All the colors of the solar spectrum vibrate through "Black" opal; some in small pin-point markings others in harlequin, broad flash, peacock and formal designs.

No two stones are alike--some are gray, some blue, some brown, some almost like the white opals with flat broad flashes, some contain a mixture of reds, blues, greens and purples, changing rapidly from one to another of these colors upon the slightest change of angle or light; others exhibit cloud effects and glorious sunsets such as Turner painted and only a Ruskin could adequately describe.

Opal was the lucky stone of the Romans and an eastern legend made the wearer of the stone beloved of God and man.

HYDROPHANE

Hydrophane is a name given to opals that have lost color and brilliancy probably through the evaporation of the water which is supposed to supply the brilliant flashes and plays of color. When placed in water or alcohol such stones temporarily regain their beauty and boiling in oil is said to restore it for some time.

CACHELONG

Cachelong is a milky white and nearly opaque variety found in the river Cach in Bucharria and also in Iceland.

GIRASOL

Girasol opal is the name given to an almost transparent variety over the convex surface of which a wave of blue light passes as the stone is moved in different directions.

TRADE NAMES

Oriental, Noble and Precious Opal are trade names given to Hungarian, Queensland and other fine opals, while Harlequin, Pin fire, and like expressions are simply used to indicate the appearance of the flashes or fire in the opal.

Matrix, brecciated and Boulder opal is opal in the matrix, cut and polished to show the fine irregular veins of opal or the broad flashes of thin opal in connection with the mother rock.

PRECIOUS TOPAZ

Precious or Brazilian Topaz belongs to the rhombic system of crystallization. Its cleavage is basal and generally highly perfect, fracture uneven, hardness 8., scratching quartz easily and only surpassed by the diamond, corundum, and chrysoberyl; Specific gravity 3.5 to 3.6; lustre vitreous, dichroism distinct, refraction double 1.61 and colors ranging from colorless or white to bluish white, light blue, straw yellow, wine yellow, golden yellow, light green, pale pink to pink.

Precious topaz becomes electric from rubbing or pressure and retains electricity for upwards of twenty-four hours. Before the blow-pipe topaz partly loses color, but does not melt--but with borax it fuses slowly to a white bead.

Topaz is partially attacked by sulphuric acid, and dissolves in salts of phosphorus. The composition of precious topaz is

Silica	33.3
Alumina	56.5
Fluorine	17.6

Colorless precious topaz is sometimes called Goutte d'eau, also "Slaves diamond;" it takes a very high polish, is wonderfully clear and transparent and has the same specific gravity as the diamond.

The great Portuguese diamond "The Braganza" weighing 1680 carats is supposed to be precious white topaz.

Commercial names for the various colors are as follows: bluish white, Siberian Topaz; golden to reddish yellow, Brazilian Topaz, pale wine yellow, Saxony Topaz; pink, Brazilian Ruby; light blue, Brazilian Sapphire--the rare greenish variety is called Brazilian aquamarine. While pink topazes are occasionally found, many of the pink stones are produced by heating certain dark yellow varieties.

This process however is always fraught with danger as the stone is apt to become colorless if heated too much or if suddenly cooled it may crack.

Precious topaz is found in the Urals, Siberia, Brazil, Germany, Ceylon, Asia Minor, Scotland, Ireland, New South Wales, South Africa, Mexico and the United States.

Quartz topaz or the ordinary topaz of commerce known as false topaz, Spanish topaz, Madeira topaz, Citrine, etc. sometimes resembles precious topaz but lacks its brilliancy and hardness, it is much lighter also being only 2.5 to 2.8 in specific gravity.

Beryl and precious chrysolite are sometimes mistaken for precious topaz--the former is lighter and the latter heavier and harder.

Oriental topaz or Yellow Sapphire is both heavier and harder than precious or true topaz.

SPODUMENE. KUNZITE.

About ten years ago large crystals of clear lilac, pink and colorless spodumene were discovered in Southern California; up to 1902 yellow spodumene from Brazil and the rare green Hiddenite from North Carolina were the only gem varieties of this mineral known to the precious stone trade. This wonderful new find was named after the well known gem expert Dr. Geo. F. Kunz and was received with great favor by lovers of beautiful stones. Kunzite is composed of silicate of alumina and lithia, is double refractive, dichroism strong, hardness $7-7\frac{1}{2}$, specific gravity 3.18, cleavage perfect in two directions and becomes phosphorescent under the action of radium. Lapidaries have found great difficulty in cutting these stones because of the cleavage.

While some large clean crystals have been found, weighing in one instance over thirty ounces troy, this beautiful mineral is not very plentiful and the finer specimens seem to be getting scarce.

Some good Kunzite has been found in Madagascar during the past few years but practically all the stones sold in this country are from California.

HIDDENITE

This emerald green variety of spodumene was discovered at Stony Point, North Carolina about twenty-five years ago by W. E. Hidden. Very few gem stones were mined and most of these have found their way into collections. There is no gem Hiddenite on the market at present and there are no known sources of supply of this beautiful green stone.

QUARTZ

The quartz group is one of the largest and most diversified among precious stones. Quartz occurs in phenocrystalline or distinctly crystalized form; and cryptocrystalline or flint-like and massive variety where the crystals, though existing, are not distinguishable by the naked eye. This group is one of the simplest in composition among gem stones, being pure silica or silicon 46.7, oxygen 53.3

Quartz crystallizes in the hexagonal system, has no distinct cleavage, fractures like glass and is 7 in Moh's scale of hardness, being harder than some garnets, harder than opal, moonstone and turquoise, and as hard as peridot and kunzite.

The specific gravity of pure quartz, such as rock crystal, amethyst, etc., is 2.65 to 2.66, and when melted to a glass by the oxyhydrogen blow-pipe the specific gravity falls to 2.2 and the hardness to 5. The pleochroism of deep colored transparent quartz is quite distinct.

Quartz is easily electrified by rubbing, quickly etched by hydrofluoric acid, and completely destroyed by that acid if immersed in it for some time. The word quartz is supposed to be of German provincial origin, and the ancients believed that clear, colorless quartz was formed by the petrification of water.

The phenocrystalline or vitreous variety consists of: Rock crystal, amethyst, citrine or topaz, smoky quartz or cairngorm, rose quartz, catseye, tiger-eye, sagenite or rutilated quartz, siderite or sapphire quartz, prase milky quartz, aventurine, and asteriated or star quartz.

The cryptocrystalline or massive variety consists of; chalcedony, mocha stone or tree agate, moss agate, spotted chalcedony, carnelian, chrysophase, plasma, bloodstone or heliotrope, jaspis, agate jasper, silicified wood, Egyptian jasper, porcelain jasper, riband jasper, green, blue and yellow jasper, agate, banded agate, fortification agate, onyx, sard, sard-onyx, beekite and hornstone.

ROCK CRYSTAL

Colorless transparent quartz is known as rock crystal, and because of its purity it is often used for spectacle lenses. Stones cut from rock crystal to imitate diamonds have been sold under many names, such as Arkansas, Lake George, Alencon, Dauphine, Paphos, Bohemian, Cornish, Irish, Bristol, etc., diamonds--sometimes simply as Occidental diamonds. Rock crystal is, of course, easily distinguishable from the diamond by its inferior hardness, its lesser density (diamond, 3.50-3.60; rock crystal 2.65), and lastly but conclusively by the hydrofluoric acid test. A drop of this acid applied to a diamond will not affect it at all, but applied to rock crystal will etch it immediately and, if allowed to remain, will eat into the stone. Formerly rock crystal was used for fashioning small articles such as fancy seals, bowls, paper weights, etc., and beautiful objects were engraved by artists, whose skill and good taste is evidenced by many wonderful rock crystal carvings in great art collections.

Rock crystal, with enclosures of rutile, green hornblende, and actinolite or asbestos, are sometimes very interesting in appearance and are often employed as odd gem stones. These stones are commercially classified under the general name of sagenite or rutilated quartz, and are either perfectly colorless and transparent or have a slightly stained appearance, which, however, is largely due to their fine needle-like enclosures. Various names, as Venus hair stone, Thetis hair stone, Cupid's darts (fleches d'amour), are used to indicate this variety of quartz.

Rock crystal is found in various parts of the world, particularly in Switzerland, France, Hungary, Brazil, Madagascar, Japan and the United States. Some of the finest material, suitable for cutting the large perfect balls for crystal gazing, comes from Brazil, while much of the commercial material is found in Switzerland.

AMETHYST

The most beautiful and probably the most important member of the quartz family is the amethyst, varying color from royal purple to the lightest shades of purple, and from brownish pink to light pink and lilac.

This stone was in great demand among Greek and Roman toppers, because of the belief that the wearing of one would permit indulgence but prevent drunkenness. Amethyst was also credited with the power to expel poison, make its wearer expert in business affairs and victorious in chase and battle. While the vogue of the amethyst has risen and waned in the past forty years, there has never been a period during that time when this beautiful stone has not been sought for by those who appreciate jewels for their artistic value. Under the dichroscope two images are generally seen in the dark colored amethysts--one reddish and one bluish purple.

Amethyst will not stand high temperature, as it loses its color and turns yellow; in fact, many of the quartz topaz are produced by "burning" amethyst.

Most of the amethyst comes from Brazil and Uruguay, the commercial designation for the medium grades being Brazilian amethyst, while the rich dark-purple stones are known as Uruguay amethyst.

Beautiful amethysts are obtained in the Ural Mountains, and although many of these stones are patchy in color, necessitating a thick style of cutting which is not suitable for modern jewelry, some very fine specimens are found and sold as "Siberian" amethysts.

The variety known as "Uruguay" amethyst is, however, more often improperly sold as "Siberian" amethyst, although there is no good reason why this should be done. Some fine amethyst pebbles are found in the gem-bearing gravels of Ceylon, but these stones are not plentiful enough to have commercial importance.

Fine reddish purple and pink amethyst has been found in North Carolina and Virginia, some of which is equal to best Uralian or Uruguay specimens. Crystals of a dark, imperfect bluish purple amethyst come from Auvergne, but this material is only suitable for cutting very small stones. "Oriental" amethyst is purple corundum or sapphire, and as these stones are rarely found having a distinct purple color, they have but little commercial importance. They are much harder and heavier than the quartz amethyst.

Other violet stones are almandine garnets, spinels and fluor spar.

Almandines are very much heavier, somewhat harder and are not dichroic. Spinel is heavier and much harder, lack dichroism and are very rare in this color.

Violet fluor spar or false amethyst is indeed very much like amethyst in appearance, but is heavier and very much softer than amethyst; it is but 4. in hardness and can therefore be readily scratched with window glass.

TOPAZ

Occidental topaz, golden topaz, Bohemian topaz, Spanish topaz, Madeira topaz, Indian topaz, Saxon topaz and False topaz are different names for yellow quartz, generally embraced under the name of citrine.

This variety of quartz, while found in its natural state, is often produced by heating or "burning" amethyst or smoky quartz, which readily turns yellow under a certain amount of heat.

Topaz varies in color from golden yellow to the darker brownish and reddish yellows generally known as Spanish or Madeira topaz.

Oriental topaz or yellow sapphires are readily distinguishable from quartz topaz by their superior hardness and weight. Precious or true topaz is harder and considerably heavier than quartz topaz. Yellow or golden beryl is harder and somewhat heavier than quartz topaz. A final and conclusive test is hydrofluoric acid which readily etches quartz topaz but does not effect either the Oriental or precious varieties or golden beryl.

ROSE QUARTZ

This stone is usually found in large fractured masses, shading from pale pink to a fine rose pink.

Transparent pieces of good pink color are rare, most of the material running translucent to sub-translucent and opaque.

The color of rose quartz, which is supposed to be due to titanium, is liable to become paler on exposure to strong sunlight.

The finer specimens of rose quartz are much sought after for jewelry, while the inferior material is worked up into useful or ornamental objects and sometimes employed in connection with objects of art.

The best rose quartz is found in the United States; some deep pink stones have been found in Madagascar, while Bavaria and the Urals are also credited with producing this stone.

RAINBOW QUARTZ, MILKY QUARTZ, PRASE

Rainbow quartz is rock crystal with innumerable irregular cracks containing films of air which show iridescent or rainbow colors.

This effect is often produced by heating quartz and immersing it in cold water, thus developing the cracks and occasionally such stones are dyed purple, green, etc.

Milky quartz is an opalescent white quartz nearly opaque with a hazy milky appearance. Prase, sometimes called Mother of Emerald, is leek or muddy olive green, translucent and rarely used except for mosaic work.

QUARTZ--CATSEYE

Hungarian Catseye, Quartz Catseye and Occidental Catseye are the various names applied to a translucent greenish or greenish-gray quartz, with fibers of asbestos running through it. When properly cut, this stone somewhat resembles the true cymophane or chrysoberyl catseye, but the chatoyant line always lacks the brilliancy and sharpness of the true catseye.

While extensively known and sold as "Hungarian" catseyes, no stones suitable for cutting are found in Hungary.

Ceylon is the chief source of these catseyes, although some are found in Bavaria and in the Harz Mountains. Oriental Catseyes, or Cymophanes as they are sometimes called, are much heavier and harder than the quartz variety.

Tiger-eye is sometimes treated with acid, and then has the appearance of the quartz catseye.

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TIGER-EYE

Early in the eighties, a beautiful yellowish-brown chatoyant quartz was found in Griqualand West, South Africa, and for some years this material was cut cabochon and sold by the carat under the name of crocidolite.

Large quantities of crocidolite were soon thrown on the market, and it was then used for the same general purposes as agates and onyx. Cameos, intaglios, umbrella handles, paper cutters- in short, all those articles which are made of agate and sold in curio shops in watering places were reproduced in this new and attractive quartz.

The name was changed to tiger-eye, although it is still often called crocidolite, as the mineral which produces the chatoyant effect is a variety of asbestos known as crocidolite, hence its original name.

Tiger-eye can be dyed like agate, and its yellow color can be changed by acid to look like the occidental or quartz catseye.

SAPPHIRINE QUARTZ

Siderite, sapphire quartz or sapphirine quartz is a translucent blue to pale grayish-blue quartz, found principally at Golling, in Salzburg.

This stone, as well as the asteriated or star quartz, is of slight importance commercially, as it is seldom found.

AVANTURINE QUARTZ

Most aventurine or goldstone used in jewelry is an artificial product made of glass and small particles of copper filings, which, because of its regular appearance, is more attractive than true aventurine.

Aventurine quartz, though occurring in other colors, is most valued when spangled with golden brown, reddish or green scales of mica, hematite, etc.

Quartz aventurine is harder than the glass imitation, but is generally less regular in color and in the distribution of the little bright spangles.

The green variety is greatly sought after in China, and is known as the Imperial Yu stone.

Aventurine quartz is found in various parts of the world.

CAIRNGORM

Smoky yellow to smoky brown are the principal tints of transparent quartz known as cairngorm or Scotch topaz, so named from a place in Banffshire, Scotland. Cairngorm or smoky quartz is, however, found in other parts of the world and notably in Colorado, Arkansas and North Carolina.

This variety of topaz is used for beads, seals and cheap jewelry sold at watering places and stopping places of tourists in Europe and the United States.

CHALCEDONY

Some confusion exists among writers on precious stones in grouping the various kinds of cryptocrystalline quartz in their relation to chalcedony or to jasper.

There is minerallogically no essential difference between these two varieties of quartz, but lapidaries generally place the translucent and sub-translucent kinds under chalcedony, and the opaque kinds under jasper.

Chalcedony therefore includes banded agate, fortification agate, moss agate, tree agate (Mocha stone), carnelian or cornelian, chrysoprase, spotted chalcedony, heliotrope or bloodstone, onyx, sardonyx, plasma and sard; while jasper includes Egyptian jasper, riband jasper, Texas agate, etc.

Beekite or silicified coral or shells, and agatized or silicified wood, may properly be treated in connection with these quartz groups.

MOCHA STONE OR TREE AGATE

This is a whitish or gray chalcedony, sometimes called dendritic agate or moss agate, which is covered with brown, red or black figures produced by manganese oxide, resembling plants or trees.

These stones were first found in the neighborhood of Mocha, in Arabia, but later have come from India, and many fine stones are found in our Western States.

Artificial tree agates have been produced in Germany by etching figures on chalcedony--infact these stones have been so perfectly etched as to deceive experts.

MOSS AGATE

Moss agates, sometimes called Indian agates, display green hair, or fibre like tracings, and are often colored red--they are found in India, China and the United States.

CARNELIAN

Carnelian or cornelian (like horn) is a variety of chalcedony varying in color from pure white, yellow, gray, grayish red, brown, reddish brown and pink, to the typical deep flesh red.

Brownish red and dark brown carnelian is called sardoine or sard; the blood red to pink color with layers of white onyx is called carnelian onyx, and the brown or sard stones with layers of white onyx is called sardonyx.

The finest sard is orange brown in color, which becomes a fine red by transmitted light.

The color of carnelian is often enhanced and deepened by exposure to the sun's rays and subsequent heating in earthen pots.

CARNELIAN (Continued)

Intaglios are generally engraved on sard--and this stone is also employed for a raised or cameo engraving in a bowl or depression of the stone--this variety of engraving is called chevee.

Brazil and Uruguay are the most important present sources of supply of rough carnelian.

CHRYSTOPRASE

Chrysoprase is a very fine grained apple green, olive, or whitish green translucent chalcedony, which generally becomes paler on exposure to light and heat--the color being due to the presence of oxide of nickel; when faded the color can sometimes be restored by immersion in a solution of nickel sulphate.

Artificial chrysoprase is produced by placing chalcedony in a green solution of nickel salt, the result being fine uniform colored chrysoprase which can hardly be distinguished from the genuine stone, and which has the advantage of being unaffected by light and heat.

Chrysoprase has a specific gravity of 2.56 and readily scratches glass.

It is found in Silesia, India and Siberia, but some of the best material produced in recent years has come from the United States.

PLASMA

Plasma is a rich green to pale green and white sub-translucent chalcedony, sometimes dotted with white or yellow spots--very much like jasper and somewhat lighter than heliotrope--this stone is found in India, China, Egypt and Germany and has but little commercial value.

HELIOTROPE OR BLOODSTONE

This is essentially the same stone as plasma, but is usually dark green in color and covered with small blood red spots of jasper, hence its name bloodstone.

This has always been a popular stone for seals and signets, and it has often been employed for fine cameos and intaglios.

The rough stones are found in India, China, Scotland, Brazil, the United States and other countries.

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AGATE

Agate, named after the river Achates in Sicily, where it was found in ancient days, is one of the most important of the chalcedony group. This variety of quartz is built of layers or bands--some of them concentric, waving or zig-zag, and others nearly straight. While the width of the bands is usually the same throughout the course, they are often extremely narrow, in fact it is stated that some agates have 17,000 definitely marked bands to the inch.

Banded or riband agate (onyx), eye agate and fortification or ruin agate comprise the agates which interest the lapidary.

ONYX (BANDED OR RIBAND AGATE)

Onyx is a variety of agate (chalcedony) having bands or layers of either black, brown or red, alternating with bands of white.

Stones having black and white bands are called onyx--those having red and white bands are called carnelian onyx, and the brown and white stones are called sardonyx.

The best specimens have the layers or planes very even and well defined, and these are the stones used for cameos; one color (usually the white) serving for the engraving and the other color for the base or background.

Agates are porous and stones are often artificially colored black or deepened in color by boiling in honey or sugar water and then in sulphuric acid.

The acid carbonizes the honey or sugar which the stone has absorbed and gives it color. For the red stones, iron oxide is used, although many red stones are improved by a process of heating or burning.

Only the most porous parts of the stones, usually the dark layers, absorb the honey or sugar, and in this manner the contrast between the colored and the creamy or white layers is heightened. The more porous the stone the deeper the color. A variety of onyx having a white layer as a base, covered with a thin black layer and a second white layer over the black, giving the stone a bluish appearance, is called onicolo or nicolo--these layers are, however, generally wavy, and nicolos are therefore easily distinguished from the more even black and white onyx.

The art of coloring agates black was well known to the Romans, but it was not until the early part of the nineteenth century that the secret of this process was acquired in Oberstein, where the agate cutting industry has existed for hundreds of years.

About the time the Germans learned to enhance the color of the black and brown bands in the agates they also discovered that heat would greatly improve the red bands, and they finally succeeded in producing blue, green and brown through the use of various coloring processes.

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EYE AGATE, FORTIFICATION AGATE

Eye agate takes the form of concentric rings with a dark centre, producing the appearance of a human eye. Fortification or ruin agate has either circular or zig-zag parallel lines, giving the appearance of the walls of a fortification and sometimes the appearance of a ruin or landscape. The colors are light to dark brown, and often show curious markings, which, when polished, are extremely interesting.

The Nahe district, including the towns of Oberstein and Idar, was one of the most important localities for agates until the discoveries of large deposits in South America in 1830.

The gem cutting industry in Oberstein dates back to 1497, and Oberstein, Idar and their outlying villages still furnish practically all the cut agates used in commerce.

Numerous cutting or grinding mills are situated on the local streams, and water power is used as a cheap method of turning the heavy sandstone grindstone used for cutting agates.

The lack of water during the summer dry season used to seriously interfere with the output of the cut and polished agates. Drought has lost most of its terrors now, as there are many well-equipped lapidary shops in the district using gas or electric power.

BEEKITE

Beekite is silicified or fossilized coral or shells, and resembles Chalcedony. It is formed by the replacement of limestone fragments in the new red conglomerate of South Devon, England. The stone also comes from Arabia, where it is called "coral" agate.

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ENGRAVING

In the art of engraving precious stones the intaglio or depressed carving preceded the cameo or raised carving by thousands of years--record is made of intaglios of chalcedony and crystal, evidently used for seals, as far back as 7000 B.C.

The engraving of Cameos was introduced in the Greek period, and onyx was then first employed to produce the beautiful effects possible with layers of stone of different colors.

The "Grand Cameo of France," one of the largest Antique Cameos in existence, is in the National Library in Paris--it has five layers of onyx and represents the Glorification of Germanicus.

Many beautiful specimens of the gem engravers or Glyptic art, in the form of cameos, and intaglios for jewels and vases and miniature sculptures are preserved in museums and private collections. While cameos have not been fashionable for about twenty-five years, there are evidences that the interest of the public is being gradually reawakened in engraved gems. Unfortunately it takes many years to produce skilled gem engravers, and as the great body of skilled workmen who turned out the best work during the last cameo revival has passed away, it will require years of steady demand to induce young men of artistic capacity to take up the difficult work of becoming proficient in the gem engraver's art.

JASPER

Jasper is an impure and opaque variety of chalcedony; the colors most commonly found being brown, yellow, red, green, black and blue.

Egyptian jasper or Egyptian pebble are names given to a variety found in Egypt and some other countries; usually brown with inner bands of lighter hue, approaching cream color, and sometimes showing dark bands with spots or markings.

A yellow and red jasper alternating with white stripes is found in Kansas, and a reddish jasper, sometimes called Texas agate, is supposed to come from that state.

Jasper is very abundant, and while it is sometimes used for jewelry it is more generally used for ornaments and small stone objects sold at watering places.

SILICIFIED WOOD

Silicified, agatized, petrified or fossilized wood is formed by the impregnation of the woody substance of plants with quartz.

The structure of the wood is often so well preserved that the nature of the original plant can be determined by a botanist.

These stones are sometimes cut to be mounted in jewelry, but more often they are used for large objects, as the fine markings can be displayed with the best effect in pedestals, table tops, etc.

Silicified wood is found in abundance in Germany, Colorado and California.

LAPIS LAZULI

Lapis lazuli, Oriental lapis, Persian lapis, lazurite, or azure stone, is not a definite mineral, but a mixture of several minerals of the sodalite group.

This stone, which was probably the stone called "sapphire" by the ancients, is composed mainly of silica, alumina and soda; it is 5 to 5.6 in hardness and is one of the lightest of gem minerals, having the specific gravity of 2.38 to 2.42.

Lapis lazuli is rarely found in crystals, and then only in very small ones. It occurs in massive state, is rarely free from veins, spots and other imperfections, and frequently contains innumerable specks of iron pyrites, popularly believed to be gold.

Its cleavage is imperfect, fracture uneven and lustre vitreous.

The colors of lapis lazuli are dark to light blue or greenish blue, sometimes blue, shading into violet.

The best lapis lazuli is very close grained, and free from cracks, spots or imperfections, with a fine azure blue color.

Fine material fit for use in jewelry has been getting scarcer from year to year, and not even the great advance in the price has brought about an increase in the visible supply of first quality rough.

Richly colored stones, even when imperfect, are in demand for making vases, mosaics and for inlaying costly ornamental furniture.

Up to the time of the discovery of the process of making the synthetic product, ground lapis was used to make the rich and durable blue paint known as ultramarine; artificial or synthetic ultramarine has, however, entirely supplanted the more costly genuine stone. While the finest lapis lazuli is often referred to as "Persian" lapis, it is doubtful if any rough lapis lazuli is found in Persia, although it probably goes there, as well as to China, from the old Afghanistan mines.

These famous mines are at Badakshan, in the northeastern corner of Afghanistan, and are still producing the best lapis, although they have been worked for many hundred years.

The celebrated Venetian traveler, Marco Polo, gives an account of his visit to these mines in 1271.

The best stones from the Badakshan mines reach Russia and are generally marketed at the great annual fair at Nijni Novgorod, thus being distributed to the world.

There are also producing lapis mines in Siberia at Lake Baikal, but most of the stones found there are inferior in quality to the Badakshan product, although they generally contain less of the iron pyrites.

The Chilian Andes contains another locality where quantities of lighter colored lapis is found--this material is often tinged with green and sometimes covered with white veins or spots.

This blue and white lapis is commercially known as lapis matrix.

Other localities where lapis has been found are in Italy, near Rome and Naples, and in Burma at the ruby diggings.

Artificially blue colored agate or jasper makes a fair imitation lapis--this stone is called false lapis or Swiss lapis, and can be readily distinguished from the genuine lapis, as it is both harder and heavier.

Sodalite (of whose group lapis is a member) somewhat resembles lapis, but this stone rarely has the fine blue lapis color, and is generally lavender tinted. It can therefore be distinguished from the more valuable member of the group.

Azurite or chessylite is sometimes substituted for lapis, but this mineral is softer, much heavier and does not closely resemble lapis lazuli.

JADE

The name jade has been indiscriminately applied to many compact or tough minerals, usually white or green in color, and embracing not only jadeite, chloromelanite and nephrite (the true jades), but also, among other minerals, saussurite, bowenite, californite, sillimanite or fibrolite, pectolite, plasma, williamsite, prehnite and agalmatolite or pagodite.

There is even uncertainty regarding the propriety of the use of the word "jade" in describing jadite and nephrite, as these are two distinct minerals, although they have the same general appearance in color and texture.

The term "jade", covering both jadeite and nephrite, is, however, firmly established in both commerce and art, and it would serve no good purpose to try and displace this thoroughly accepted word, especially as no other descriptive term could possibly be found to answer as well.

Jade served prehistoric man from which to fashion implements and ornaments, and many axes, hammers, chisels and some rudely carved idols made from this exceptionally tough mineral have been found in different parts of the world, and especially in Europe among remains of the stone age.

Modern lapidaries, who experience the greatest difficulty in cutting and polishing jade, marvel at the skill and patience which must have been employed by primitive man in fracturing and grinding the wonderful jade weapons and tools which form part of many important collections. In China jade or yu shih (yu stone) has always been held in the greatest esteem, although the term yu actually embraces other jade-like minerals which are white to dark green in color.

The Chinese give jade the preference over every other stone, and as a result jade is a very important article of commerce in that country.

Canton handles most of the cut jade, and one street in that city is entirely given over to jade merchants. Remarkably high prices are paid for the finest jade in China, and a noted American merchant expert states that a small necklace of jade beads, each one measuring less than 1/4 inch in diameter, is valued as high as \$1,000 to \$3,000; a single green ring stone, \$200 to \$400, while thumb rings have been quoted as selling occasionally as high as \$15,000 to \$20,000 each. Translucent white, the color of fresh lard, is said to be the rarest of the jades, while yellow and green jades are prized according to their shades of color and condition of translucency.

Some emerald-green jade has been found translucent to almost transparent, and such stones approach the emerald in beauty and brilliancy.

Chinese lapidaries are extremely skillful in cutting, polishing and carving jade ornaments and in producing jade vessels, brush holders and objects of art, often ornamented with gold and precious stones.

The Heber Reginald Bishop collection of jades, in the Metropolitan Museum of Art, New York City, is one of the most important collections of rough, cut and carved jades in the world. Here can be seen and studied rough jadeite and nephrite, prehistoric weapons and tools, crudely carved idols and ornaments, wonderfully carved and jeweled bowls, vases, sword handles, bottles, flowers, ornaments--in short, a complete exposition of jade and of the most priceless objects fashioned therefrom. A visit to the special room in which this collection is housed will be of great value to any jeweler, and at the same time afford keen gratification to every lover of beautiful things.

JADE (Continued)

JADEITE

Jadeite and chloromelanite are members of the pyroxene or augite group of minerals--chloromelanite being a dark green or black variety, differing somewhat in composition from jadeite and containing about 10 per cent. of sesquioxide of iron, which slightly increases its specific gravity over that of jadeite.

This extremely tough fibrous mineral has prismatic cleavage, splintery fracture, hardness of 6.5 to 7, specific gravity 3.2 to 3.4 (chloromelanite 3.4 to 3.6), refraction double 1.66 and 1.68, lustre subvitreous, streak uncolored; it is opaque to translucent, and fuses easily to a blebby glass in an ordinary flame, coloring the flame a bright yellow.

Jadeite is composed principally of silica, alumina and soda.

NEPHRITE

Nephrite is a tough, compact and uniformly fibrous and fine-grained tremolite or actinolite, belonging to the amphibole or hornblende mineral group.

It breaks with a splintery fracture, hardness 6 to 6.5 specific gravity 2.9 to 3.1, refraction double 1.606 and 1.632 lustre somewhat oily, is opaque to translucent, is not attacked by acids, and fuses with difficulty before the blowpipe to gray slag.

Nephrite is composed principally of silica, magnesia and lime.

Jadeite and nephrite occur in the following colors: marble or milk white, greenish and bluish white, white with green patches or spots, white veined with green, pale gray, yellow, brown, blue-green, leek-green, apple green, emerald green, pale amethystine, and, rarely, white with a tinge of red or rose red.

The same colors seem generally to be present in both jadeite and nephrite, in fact, it is claimed that sometimes both minerals are found to be combined in the same specimen, and while it is easy to distinguish these stones in the rough, principally through the great difference in their fusibility, it is more difficult to do so in cut and polished specimens, because the specific gravity and hardness of jadeite and nephrite often approach too closely to make these tests conclusive. There does not seem to be any difference in the commercial value of jadeite and nephrite where the two stones are identical in color and translucency.

Besides the names jadeite, chloromelanite and nephrite, jade is known as axe or hatchet stone. It is also called kidney stone because it is supposed to cure kidney diseases. In New Zealand it is called greenstone, and the Maoris also call it pumanu or axe stone.

The Maoris carve jade into a grotesque form of the human figure, called "tiki", which is worn as an amulet.

RESULTS

Analysis and interpretation of the results of the present study are given in the following paragraphs. It is to be noted that the results are given in the form of percentages of the total number of cases.

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DISCUSSION

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JADE (Concluded)

Jade is very resonant, and is sometimes used by the Chinese as material for a musical instrument. The stones so used are called sounding stones.

Chalchihuitl of the Aztecs, like the yu stone of the Chinese, probably included a number of minerals, notably jade and turquoise. The important jadeite mines in Burma are under the control of the British government, and were discovered about six hundred years ago. They produce large quantities of this valuable mineral. These mines are in Upper Burma, in the Mogoung district, on the upper course of the Uru river.

The native miners build fires on the surface of the stone, and the rapid cooling causes the jadeite to crack. It is then easily broken up and sold to Chinese buyers on the spot.

About 400,000 pounds of Jadeite, mostly medium and poor quality, is quarried annually, the product being valued at about \$250,000. Fine material brings high prices, and there is a record of a block, measuring about a cubic yard, for which \$40,000 was refused. About \$500,000 worth of jade is supposed to be used in China annually.

Nephrite has been discovered in place in Alaska, at Jade mountain.

Other localities where jadeite or nephrite have been found are southern border of Turkestan, Eastern Siberia, New Zealand (Silesia in Germany, where a boulder weighing 4,718 pounds was discovered at Jordansmuhl and now forms part of the Bishop collection), New Guinea, New Caledonia, and possibly also Mexico, South America and India.

Some other jade-like minerals are bowenite (nephrite bowen); a green serpentine, somewhat resembling nephrite, but much lighter and somewhat softer, as its specific gravity is 2.59 to 2.78 and hardness 5.5 to 6.

Saussurite; a tough compact variety of zoisite, fracture splintery, hardness 6.5 to 7, specific gravity 3.0 to 3.4, translucent to opaque, colors from white to gray, bluish green and greenish gray.

Sillimanite or fibrolite; a densely compact mineral, perfect cleavage, fracture uneven, hardness 6 to 7, specific gravity 3.23 to 3.24, lustré vitreous, colors brown, grayish white, grayish green, transparent to translucent. This mineral was also employed to make weapons in Western Europe by prehistoric man.

Pectolite; massive, fine grained, tough, cleavage perfect, fracture uneven, brittle, hardness 5, specific gravity 2.68 to 2.78, color pale green resembling jade, used by Alaska Indians for implements.

Williamsite; an apple green variety of serpentine, hardness 4.5, specific gravity 2.59 to 2.64.

Prehnite; cleavage distinct, fracture uneven, hardness 6 to 6.5, specific gravity 2.80 to 2.95, subtransparent to translucent, oily green passing into white and gray, often fading on exposure to light.

Agalmatolite or pagodite; member of mica group--of amorphous compact texture, very soft, hardness 2 to 2.50, specific gravity 2.78 to 2.81, grayish, grayish green, brownish, yellowish. Chinese use this stone for carving into images, pagodas, etc. It is also called image or pagoda stone.

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FELDSPAR

Feldspars form a group of minerals similar in constitution, properties and form; their general characteristics being, cleavage in two similar directions nearly at right angles, hardness between 6. and 7., specific gravity varying between 2.5 and 2.9 (precious varieties 2.5 to 2.72), all fusing with difficulty before the blowpipe and composition silicate of aluminum with either potassium, sodium or calcium and rarely barium.

The precious feldspars include the minerals orthoclase, microcline, albite and labradorite and embrace moonstone, sunstone, amazon stone, and labrador stone.

MOONSTONE

Moonstone, also known as orthoclase, orthose, adularia, adularian feldspar, fish-eye, wolf-eye, girasol and ceylonese or water opal, was probably the solis gemma of Pliny.

The name adularia was given to the stones found in Switzerland near Mount Adular.

This beautiful stone, while not confined to one member of the feldspar group, is found in its greatest perfection and beauty in orthoclase or the potassium feldspar.

Moonstone is highly translucent to transparent and when cut en cabochon or convex, reflects a bright white or bluish light which plays over the surface from side to side and strongly resembles the light of the moon.

Moonstone occurs in crystals, crystalline fragments and in massive and granular formation.

Its hardness is 6--7, specific gravity 2.55 to 2.67, refraction double, luster vitreous, streak brilliant and pearly and it is not attacked by acids.

The composition of orthoclase or potassium moonstone is:

Silica	64.7
Alumina	18.4
Potash	16.9
	<u>100.</u>

Moonstone has been found in Switzerland, Brazil, Urals, Germany, Greenland, Norway and the United States, but the finest specimens come from Ceylon which practically is the sole source of the commercial supply of this beautiful and interesting gem.

Moonstones are invariably cut en cabochon with a rather high apex to bring out the moonlight effect--the blue material being much sought after and consequently higher priced.

Many fine moonstones have been engraved as cameos.

Following from a study of the effect of temperature on the rate of reaction, it was found that the rate of reaction was increased by a factor of 2.5 when the temperature was raised from 20°C to 30°C. This is in good agreement with the theoretical prediction that the rate of reaction should be increased by a factor of 2.5 when the temperature is raised by 10°C.

The results of the experiment are shown in the following table, which gives the rate of reaction at different temperatures. The rate of reaction is measured by the volume of gas evolved per unit time.

TABLE I

The following table shows the rate of reaction at different temperatures. The rate of reaction is measured by the volume of gas evolved per unit time. The results are shown in the following table, which gives the rate of reaction at different temperatures.

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Temperature (°C)	Rate of reaction (cm ³ gas / min)
20	1.0
30	2.5
40	6.25
50	15.6

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Thus the rate of reaction is increased by a factor of 2.5 when the temperature is raised by 10°C.

AMAZONITE

Amazonite, amazon stone, microcline feldspar or green feldspar is almost identical with orthoclase and is known as potash feldspar.

Amazonite is 6 to 6.5 in hardness, has a specific gravity of 2.5 to 2.6, is brittle, fracture uneven, luster vitreous to pearly, is translucent to opaque and ranges in color from a fine emerald green to bluish green and from the darkest to the lightest shades of these colors.

Acids do not affect amazonite and it melts with difficulty before the blowpipe.

Amazonite is rarely even in color but has a patchy appearance with small white streaks and spots. Although the name amazon stone was given in the middle of the eighteenth century because of its discovery by the Spanish among the Indians dwelling on the Amazon river, it was known to ancient lapidaries and some skillfully engraved Assyrian cylinders of this mineral are in the British Museum.

Amazonite when cut cabochon is a very effective low priced gem; this mineral is also used for small objects such as paper weights, bowls, vases, paper cutters, etc.

Amazonite is found in Russia (where it is called krimspath or green spar) and in the United States--the finest material coming from Virginia, although some good specimens have been found at Pikes Peak, Colorado.

SUNSTONE

Oligoclase is the mother species of the variety known as sunstone or aventurine feldspar.

This term is also applied to other kinds of feldspars which have the common feature of golden yellow or reddish prismatic reflections which proceed from masses of minute crystals of hematite, gothite or mica imbedded in the stone.

While sunstone greatly resembles aventurine quartz it is not quite as hard as quartz. Ordinary aventurine or goldstone is a product manufactured of glass and small particles of copper filings and while more attractive in appearance than the genuine stones it is soft and therefore not durable.

Sunstone is transparent to translucent, its hardness is 6.--7., luster pearly or waxy to vitreous and specific gravity 2.65 to 2.67.

This stone was very rare and costly at one time when the only known locality was near Archangel. It was subsequently found near Stockholm, Finland, Urals, Ceylon, Switzerland, Iceland and United States, and has but little commercial value at present.

LABRADORITE

Labradorite, labrador spar, labrador stone and labrador feldspar, are various names for a beautiful variety of feldspar discovered by Moravian missionaries on the island of Saint Paul off the coast of Labrador the

LABRADORITE (Continued)

latter part of the eighteenth century. Labradorite is 5.--6. in hardness being considerably softer than quartz; has specific gravity of 2.70 to 2.72; is brittle; vitreous to pearly in luster; translucent to opaque; can be decomposed by muriatic acid and fuses with difficulty before the blowpipe.

Labradorite is composed of

Silica	52.9
Alumina	30.3
Lime	12.3
Soda	4.5
	100.

With a dull grayish background this stone possesses brilliant chatoyant colors which appear and disappear as the polished stone is turned from side to side. All shades of blue and green are the usual colors-but occasionally yellow and red are met with.

Specimen pieces of labradorite exhibit the sombre broad flashes of some of the darker varieties of black opal, while others are like the wings of tropical butterflies.

Labradorite is occasionally engraved as a cameo but more often cut cabochon or even with a flat surface, as the formation of this stone is such that its beauty is best displayed through such cutting.

Labrador is still the principal source of supply although this stone is also found in Greenland, Norway, Finland, Sweden and the United States.

ANDALUSITE

Andalusite, a member of the Danburite topaz group, received its name from Andalusia, Spain, where it was first found.

In composition this stone is a silicate of alumina, being about three-fifths silica and two-fifths alumina.

The principal characteristics of andalusite are as follows: hardness, 7 to 7.5; specific gravity, 3.16 to 3.20; luster vitreous; cleavage distinct and fracture sub-conchoidal.

This stone is not attacked by acids; is infusible before the blowpipe and heated in a cobalt solution turns blue.

The colors are light rose red, olive green, reddish brown, whitish gray and sometimes yellowish brown.

Andalusite is highly dichroic, the crystals being reddish in one direction and greenish in another, the dichroscope showing distinct olive green and red colors.

Andalusite is seldom sold as a cut gem although it is said to be quite plentiful in pebble form in the gem gravels of the Calhao and Sta. Maria rivers near Minas Novas in the State of Minas Geraes, Brazil.

ANDALUSITE (Continued)

A pale salmon pink variety is found in the Botucatu mountains in the State of S. Paulo, Brazil, which is probably like the small pink crystals which have been found at Westport, Mass.; the Westport crystals are too small to cut into gems.

Some specimens when cut are green in the body of the stone while the end facets are a brownish red. This stone therefore presents the two-color characteristic of the green chrysoberyl or alexandrite and the resemblance is close enough to deceive the ordinary buyer.

The green and the brownish red of the alexandrite is generally deeper than the like colors in an andalusite besides which the alexandrite is both heavier and harder; the comparative qualities being:

Alexandrite

Specific Gravity	3.65 to 3.80
Hardness	8.5

Andalusite

Specific Gravity	3.16 to 3.20
Hardness	7 to 7.5

Andalusite may also be confused with tourmaline which has about the same degree of hardness and is only slightly lighter (Spec. Grav. 3 to 3.1), the two color characteristic of the andalusite and the electric property of the tourmaline should however prove sufficient to make a proper determination.

Andalusite is said to occur also in the Tyrol, Saxony, Urals, Ireland, England, Pyrenees, Brittany, Ceylon and California.

(Chiastolite)

Chiastolite or macle is a peculiar variety of andalusite, having its essential qualities except transparency, color and crystallization.

The name chiastolite or cross stone is derived from the Greek letter chi (represented by X), the Spaniards called the stone lapis crucifer and many of these stones were sold to the superstitious who wore them as amulets.

The cross formation is brought about by the penetration and replacement of the andalusite by dark clay slate varying in thickness in different parts and running centrally throughout the whole length of the crystal--the slate also penetrates the four corners of the crystal and thus a dark cross on a white, gray, brown, flesh colored or parti-colored background varying in size and shape, is the result.

A dissected chiastolite crystal presents some very attractive markings and as these stones take a good polish they are suitable for jewelry.

The black figures on these stones are crosses, squares, square outlines and combinations of these markings.

Chiastolite has about the same specific gravity as andalusite but is much softer, being only 5 to 5.5 in hardness.

THOMSONITE

Thomsonite is a zeiolite composed of soda, lime and alumina and notwithstanding the absence of some essential qualities of a precious stone the great beauty of polished specimens of this material makes it suitable for certain kinds of jewelry. Thomsonite is found in weathered masses or rolled pebbles on the shore of Lake Superior at Good Harbor Bay and when polished exhibits a number of concentric bands in delicate shades of flesh red, milk white, yellow and green, alternating with each other and sometimes resembling agate. A green variety of thomsonite is called lintonite.

These stones are brittle, have a perfect cleavage, fracture conchoidal, luster vitreous, hardness 5--6 and specific gravity 2.3 to 2.4.

Although occurring in Scotland, Germany, Bohemia, Sicily, Norway, Hungary, Tyrol, Iceland and Nova Scotia this stone is rarely used for jewelry except in this country, where it has a special value as a "native" stone and is cut and sold to tourists at various points on Lake Superior.

CHLORASTROLITE

Chlorastrolite is another "native" stone occurring only on Isle Royal, an island belonging to the state of Michigan situated twenty miles from the mainland in Lake Superior.

These stones are found on the shores of the island in small rounded pebbles with finely radiated or stellated structure and are of a light bluish green color.

The stones are small, rarely exceeding an inch in diameter and occasionally exhibiting a chatoyant appearance. Chlorastrolites are opaque, have the hardness of 5.5 to 6; specific gravity 3.18 and as they admit of a high polish they form a very pleasing addition to odd stones suitable for jewelry.

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IOLITE

Iolite, cordierite, dichroite, water sapphire, saphir d'eau, lynx sapphire, lynx stone, Spanish lazulite, steinheilite, prismatic quartz and peliom are the different names of a beautiful and curious stone remarkable for its pleochroism.

Three of these names are usually employed by writers and gem merchants--two from the Greek; iolite or violet stone and dichroite or two colored stone and the third, cordierite, called after the French geologist Cordier who first studied the crystals of the species.

The dark blue stones are sometimes known as lynx sapphires or lynx stones and the paler blue stones as water sapphires or saphirs d'eau.

Iolite is brittle; fracture sub-conchoidal; cleavage distinct; luster vitreous to greasy; hardness 7.--7.25; specific gravity 2.60 to 2.67; transparent to translucent; is partly decomposed by acids; melts with difficulty before the blowpipe; slightly doubly refractive and strongly pleochroic.

Iolite is a silicate of aluminum and of magnesium iron; its composition being:

Silica	49.4
Alumina	33.6
Ferrous oxide	5.3
Magnesia	10.2
Water	1.5
	100.

The colors of iolite are blue slightly tinged with violet, smoky blue, light blue, greenish blue, and rarely yellow, green and brown.

The pleochroism of this stone is more marked than in most other minerals, its colors often being in such contrast as to be easily distinguished without the aid of the dichroscope. Three colors can sometimes be seen, the light transmitted in one direction showing a fine dark blue; in another direction perpendicular to this a pale blue, while in a third direction the color is a pale grayish or yellowish white.

Sometimes iolites have the asteria characteristic of the star sapphire which can be brought out by cabochon cutting.

Iolites are readily distinguished from other blue gems; they are softer and much lighter than sapphires; have about the same hardness but are lighter than tourmalines; are much lighter and softer than spinels which are singly refracting and totally lack the quality of dichroism. Because of the great scarcity of small dark blue aquamarines iolites are frequently sold for these rarer stones although in most cases the dealers who sell them are probably unaware of the deception.

Aquamarine is harder and somewhat heavier than iolite and as it is only slightly dichroic there should be no difficulty in differentiating the clear greenish blue aquamarine from the smoky greenish blue iolite.

Ceylon produces most of the iolites suitable for cutting. They have also been found in Minas Novas, Brazil; Haddam, Conn.; Norway; Spain; Bavaria; Sweden; Mexico; Finland; Greenland and Tuscany.

IDOCRASE
(Vesuvianite)

Idocrase or Vesuvianite is a silicate of aluminium and calcium and when first discovered at Vesuvius was called volcanic scoria, brown jacinth, volcanic chrysolite, Vesuvian gem and Italian chrysolite.

This stone is not generally used for jewelry except in Italy, where the handsome green and brown varieties are cut and sold as "Vesuvian Gems".

Idocrase is composed of

Silica	37.75
Alumina	17.23
Sesquioxide of iron	4.43
Magnesia	3.79
Lime	37.35

Its hardness is 6.5; specific gravity 3.35 to 3.45; it is transparent to opaque, although the majority of the crystals are translucent to subtranslucent; its lustre is vitreous to greasy; it is doubly refractive, is attacked by acids and melts easily under the blowpipe.

The cleavage of idocrase is not distinct; its fracture sub-conchoidal to uneven and dichroism only moderately strong, the green idocrase showing pure green and yellowish green images.

Its colors are brown to black, yellow and green, sometimes red, blue and colorless--the colors commonly found are various shades of brown and green.

These stones are found in crystalline form principally in Ala Valley in the Mussa Alps and in the Wilui River in Siberia. The green crystals from Siberia are sometimes called wiluite and the brown crystals ejected from Mount Somma, the old crater of Mount Vesuvius, are known as vesuvianite. The blue variety of idocrase is also called cyprin, while the dark yellowish variety is sometimes known as xanthite.

Chrysolite, green garnet, quartz, tourmaline and other gems are somewhat similar to idocrase, but the differences in specific gravity, hardness and refraction will generally be sufficiently pronounced to determine the species.

CALIFORNITE

Californite is a compact variety of idocrase sometimes resembling jade in color and very like jade in hardness, toughness, texture and specific gravity; it was first found in several localities in the Alps and was then mistaken for jade.

Its hardness is 6.5, exactly that of the crystalline idocrase and specific gravity 3.28 to 3.45. The color varies from olive to clear apple and grass green, sometimes gray and usually with bright green spots scattered through the stone--occasionally bluish green, yellowish green, white, and stones with a pink tint are found.

Some of this material is translucent and some subtranslucent to opaque.

Californite takes a good polish and as the dark green enclosures in the yellowish leek green specimens are generally more translucent than the surrounding mass the effect is beautiful.

Californite obtained its distinctive name because of its plentiful occurrence in California, and is classed as one of the native stones of that state.

BENITOITE

Benitoite, a distinctive American gem, was discovered near the San Benito-Fresno County line in California in 1906.

These stones were first supposed to be sapphires because of their fine blue color, but a closer examination by experts and a chemical analysis disclosed a new gem composed of titano silicate of barium.

Benitoite is softer and less dense than sapphire, its hardness being $6\frac{1}{4}$ - $6\frac{1}{2}$ and specific gravity 3.62-3.80.

This stone is very brilliant by daylight, its refractivity being somewhat higher than that of the sapphire, but under artificial light the benitoite becomes less intense in color and loses some of its brilliancy.

Its dichroism is very pronounced, the colors being dark purplish blue and lighter blue to colorless.

Benitoite ranges in color from deep violet tinted blue to purer blues of a lighter shade, some of the crystals being colorless.

This mineral is attacked by hydrofluoric acid, which is another easy test to distinguish it from sapphire, which is not affected by this acid. It dissolves in fused sodium carbonate and fuses under the blowpipe to transparent glass.

Gem blue benitoite has only been found in small quantities and sizes, the largest cut perfect stone weighing but seven carats, while most of the cut stones weighed less than two carats each; at present benitoites are uncommon and are therefore not dealt in commercially.

MALACHITE

Malachite is a basic cupric carbonate found in copper mines all over the world.

While its use in jewelry and the arts dates back to the time of Theophrastus, who called it pseudo-emerald, it has been considered essentially a Russian mineral because of the extensive use of this stone for ornamental purposes in Russia.

Malachite is composed of:

Carbon dioxide	19.9
Cupric oxide	71.9
Water	8.2
	100.

Its hardness is 3.5 to 4; specific gravity 3.6-- 4; it is translucent to sub-translucent and opaque (generally opaque) lustre brilliant and silky, texture compact with concentric veinings which vary in shades of green

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MALACHITE (Continued)

from light to dark; cleavage perfect, fracture sub-conchoidal, and melts on charcoal to metallic copper. Hydrochloric acid causes effervescence on malachite which readily distinguishes it from other green stones of similar appearance.

Emerald or verdigris green, to dark green and occasionally leek green to blackish green are the usual colors of malchite.

Malachite sometimes occurs in small needle like crystals, but the best cutting material usually occurs in nodular fibrous masses having the grained character which looks so well in the polished stones.

Malachite is not brittle and is easy to work; in fact it has often been worked on lathes.

The Greeks and Romans employed this mineral for gems, ornaments and amulets, as it was supposed to have the virtue of protecting children from danger.

A number of malachite columns found in the Temple of Diana at Ephesus are now part of the Sophia Church at Constantinople, while a more modern use of large masses of malachite is to be found in the beautiful columns of this mineral in the famous Isaac Church at Petrograd.

Large objects such as mantels, table tops and art objects, while seemingly of solid malachite, are often only veneered with thin sheets of this mineral cunningly joined together by the expert Russian workmen. The Russian Government has presented many fine objects made of malachite to friendly nations.

While found in copper mines in every part of the world, some of the largest masses of malachite were discovered in Russia, one block measuring nine by eighteen feet at the top and weighing half a million pounds.

Fine cutting material has been found in Australia and in Arizona.

AZURITE

(Chessylite)

Azurite, sometimes called chessylite, or chessy copper, because it is found at Chessy, near Lyons, France, also called blue malachite and blue carbonate of copper, is similar in composition to malachite, the constituent parts however being present in different proportions.

Azurite is composed of

Carbon dioxide	25.6
Cupric oxide	69.2
Water	<u>5.2</u>
	100.

AZURITE

(Chessylite) (Continued)

Its hardness is 3.5--4; specific gravity 3.77--3.88; it is translucent; lustre vitreous, almost adamantine, and has all shades of blue from azure to berlin blue; some has the fine blue color of lapis lazuli, but as it is softer than lapis lazuli and effervesces under hydrochloric acid it can readily be distinguished from that more valuable mineral.

Azurite is rarer than malachite and is found, generally in crystalline form, in copper mines.

AZURITE-MALACHITE

(Azurmalachite)

This is a brecciated mineral consisting of azurite and malachite mixed in a mineral matrix, forming a very beautiful and interesting stone because of the contrast between the various shades of blue and green mingled in the same stone.

CHRYSOCOLLA

Chrysocolla is a hydrated silicate of copper found with other copper ores and often mingled in compact form with malachite, azurite and quartz.

Much of this material is beautiful because of its enamel-like texture and its color, which often rivals that of the finest blue turquoise; in fact it is sometimes difficult to distinguish chrysocolla from turquoise.

Chrysocolla was used by the ancients for painting, medicine, and principally as a solder for gold, the name signifying in Greek, gold glue.

The colors are mountain green, bluish green passing into sky blue, turquoise blue, and in the impure varieties, brown and black.

Chrysocolla is composed of

Silica	34.3
Copper oxide	45.2
Water	20.5
	100.

Its hardness is 2--4, specific gravity 2--2.38, fracture conchoidal, translucent to opaque, lustre vitreous and sometimes earthy. Although this is a soft stone it sometimes has a chalcedony coating which makes it possible to cut very pretty, durable cabochon stones from this material.

Some of the best compact chrysocolla of a rich bluish green color mixed with quartz is found in copper mines in Michigan and Arizona.

EPIDOTE

Epidote, though seldom used as a gem, is interesting because of its peculiar yellowish green (pistachio) color, rarely found in other minerals.

Its hardness is 6--7, specific gravity 3.25--3.50, lustre vitreous, refraction double, transparent to translucent and sub-translucent and is fusible before the blowpipe.

Its composition is:

Silica	37.83
Alumina	22.63
Ferric oxide	14.02
Ferrous oxide	.93
Lime	23.27
Water	2.05

Colors are usually pistachio or yellowish green to brownish green, greenish black and black, sometimes clear red and pale yellow, also gray and grayish white.

One of the characteristics of epidote is its strong dichroism, which distinguishes this from other green and brown stones.

Green and brown tourmalines, though highly dichroic, are lighter; being but 3--3.1. The finest cutting crystals are found in Salzburg; some are found in Brazil and in the United States.

An epidote matrix, consisting of a mixture of grayish green epidote and reddish and gray minerals in compact, massive form, is used to make attractive low priced cabochon stones--a rose red variety of Zoisite, named thulite, after Thule, an ancient name of Norway, is also used in the same manner.

Piedmontite, a variety of epidote found principally in the Piedmontise Alps, sometimes occurs in splendid red crystals. These, when sufficiently transparent, are cut as gems, but they are seldom met with in commerce.

UTAHLITE

(Variscite, Amatrice)

Utahlite, chlor utahlite, amatrice (signifying American matrix) is a composite stone generally containing variscite, wardite, chalcedony, chert and other allied minerals. Variscite is about 4, in hardness and wardite about 5, chalcedony and chert 7.; therefore a specimen of utahlite will vary in hardness according to the portion under examination.

Compact variscite sometimes resembles jade and some of the finer green material has been sold as such.

Wardite is green, bluish green and white, while chert is gray to yellowish and brown; brown limonite in stains is often present.

The utahlite or amatrice of commerce contains most or all of these minerals in various patterns and in brecciated and concentric markings and the results of the various combinations and shadings of colors, especially the fine greens, is very pleasing.

These stones are found in Utah in rounded or kidney shaped masses with a rough external coating enclosing the attractive green material.

Variscite is sometimes found free from matrix and occasionally in shades of blue, approximating greenish turquoise. It is softer than turquoise, but does not fade as many green turquoise do.

PHENAKITE

Phenakite is a beryllium mineral and one of five precious stones containing the earth glucina as an essential constituent, the other four being beryl, chrysoberyl, euclase and beryllonite. This stone is composed of:

Silica	54.45
Glucina	45.55

Phenakite is 7.5 to 8 in hardness, has the specific gravity of 2.96 to 3; is doubly refractive, fracture conchoidal, brittle, imperfect in cleavage; is not attacked by acids and is infusible except with borax.

It is transparent to subtranslucent; dichroic and where the stones possess color the ordinary image is colorless while the extraordinary image is warm yellow or brown. The clear colorless crystals are very brilliant and when cut and polished often approximate the diamond in brilliancy especially when observed under artificial light.

The colors of phenakite are colorless to bright wine yellow, pale rose red and brown.

Phenakite is found in the emerald mines at Tokowaja in the Urals and most of this Russian gem material is cut and sold locally at very high prices. In 1908 some good cutting material of a waterclear hue was discovered at Sao Miguel de Piracicaba, Minas Geraes, Brazil, also some stones of a faint reddish tint.

Some fine specimens both in crystal and in cut form are in the mineralogical gallery of the British Natural History Museum. Phenakite has also been found in the United States (principally Colorado) and in France.

Phenakite owes its name to the frequency with which it has been mistaken for quartz because of the resemblance of the crystallization; hence the name, which in Greek signifies "deceiver".

The greater density of phenakite, its superior hardness and infusibility makes it possible to establish the difference between it and quartz while greater density of precious topaz readily differentiates that mineral.

EUCLASE

Euclase is a silicate of aluminium and beryllium nearly like beryl in chemical composition and resembling aquamarine when cut.

Its composition is:

Silica	41.3
Alumina	35.2
Glucina	17.3
Water	6.2

The hardness of euclase is 7.5, specific gravity 3.-31., luster vitreous and somewhat pearly on cleavage face, cleavage highly perfect, fracture conchoidal; it is not acted upon by acid, it is electrified by friction, it is transparent to sub-transparent, has distinct pleochroism in the colored varieties and is found in colorless, pale mountain green, sea green, green with blue or yellow tinge, straw color and blue. The usual color is green while the colorless stones are rare.

Euclase was named by Haüy from two Greek words signifying "easy fracture" because of the easy cleavage--this cleavage peculiarity makes it difficult to cut and facet these stones.

Euclase is easily distinguished from beryl because of the superior density of the latter.

Euclase gems are very rare and are seldom found in commerce, the best material coming from Brazil, where it is found with precious topaz at Boa Vista and Capas da Lana near Ouro Preto in Minas Geraes; it has also been found in the Urals and Ceylon.

AXINITE

Axinite is a mineral which because of its rarity and the small size of its transparent crystals is rarely cut as a gem stone. Most of the cut stones, however, which are produced from this mineral are cut cabochon shape.

Axinite derives its name from the peculiar wedge or axe shape in which it crystallizes.

In composition it is remarkable for being one of two gem minerals (the other being tourmaline) in which the element boron occurs.

Axinite is transparent to sub-translucent but is generally found in compact masses unsuitable for gem cutting. Its hardness is 6.5 to 7., specific gravity 3.27 to 3.30, luster vitreous, fracture conchoidal, cleavage distinct and it fuses easily before the blow-pipe.

Axinite is found in cinnamon brown, plum blue, honey and greenish yellow and gray colors, and as it is strongly dichroic its greenish stones give olive green and violet blue, and its cinnamon brown give cinnamon brown and violet blue colors for their ordinary and extraordinary images.

Axinite is easily distinguished from quartz and tourmaline by these strong dichroic colors, besides which it is somewhat denser than tourmaline and much denser than smoky quartz, for which it is mistaken.

Axinite has been found at St. Christophe, France; the western and Tyrolese Alps, Cornwall, Mexico, Tasmania and the United States.

PYRITE

IRON PYRITES, INCA STONE, MARCASITE

Pyrite, iron pyrite and inca stone are different names for bisulphide of iron, one of the most widely distributed of the metallic compounds.

Marcasite is included by jewelers in the species pyrite and pyrite in the species marcasite because the two minerals have the same two elements and only differ in physical and chemical characters. Pyrite is composed of 53.3 sulphur and 46.7 iron, its luster is brilliantly metallic, hardness 6. to 6.5, specific gravity 4.95 to 5.10 (marcasite 4.85 to 4.90) cleavage indistinct (marcasite distinct); it is brittle, is completely decomposed by nitric acid and burns under blowpipe, giving off sulphur dioxide.

The color of pyrite is pale brass yellow, that of marcasite is pale bronze or grayish yellow. Some of this material consists of a coating of small bright crystals forming a sparkling surface of even height on the surface of black shale and very effective stones have been produced by shaping the shale into conventional sized stones for use in moderate priced jewelry.

Large polished plates probably used as mirrors have been found in ancient graves of the Incas, hence the name inca stone.

Pyrite and marcasite is found in all parts of the world--pyrite being the more abundant mineral.

RUTILE

Rutile is a pure titanium oxide of common occurrence which does not as a rule possess sufficient beauty to permit its being cut. Some rare specimens, however, when cut, more closely resemble black diamonds than any other gems and are therefor valuable additions to the jeweler's stock.

Rutile is brittle, its fracture is subconchoidal to uneven, hardness 6. to 6.5, specific gravity 4.18 to 4.25, luster metallic to adamantine; refraction strongly double, and dichroism marked in transparent specimens; it is transparent to opaque.

The color of rutile is various shades of red passing through browns to black, sometimes yellowish bluish violet and rarely grass green.

Transparent quartz penetrated with needle-like crystals of rutile is called sagenite or crispite, while smoky quartz similarly penetrated is known as Venus hair stone, Thetis hair stone and fleches d'amour (Cupid's darts). Rutile is found in Norway, Sweden, Urals, Tyrol, France, Spain, Transylvania, Scotland, Ireland, Canada and the United States.

OCTAHEDRITE

ANATASE

Octahedrite or anatase is one of three forms of crystallized titanium oxide, which though too soft to be largely used as a gem, is highly valued because of its remarkable brilliancy, approximating that of the diamond.

Octahedrite is 5.5 to 6. in hardness, has the specific gravity of 3.82 to 3.95, perfect cleavage, conchoidal fracture, adamantine or metallic luster, strong double refraction, is brittle and transparent to nearly opaque.

The colors of octahedrite are various shades of brown passing into indigo blue and black, greenish yellow and pale green.

These stones occur in France, Germany, Norway, Urals, Wales, Brazil, and the United States.

Some very fine small, clear, crystals are found in the diamond-bearing gravels in Minas Geraes as well as in other parts of Brazil.

STAUROLITE

Staurolite named from the Greek word signifying cross is found in various parts of the world and while it is rarely transparent enough to cut as a gem its perfect cross-like crystals have given rise to the legend in Brittany that these stones dropped from heaven, with the result that many of the crystals found a ready sale as ornaments and charms.

Staurolite is 7.5 in hardness, has a specific gravity of 3.65 to 3.75, is sometimes transparent, has distinct pleochroism, is sub-vitreous to resinous in luster, has distinct cleavage, conchoidal fracture and is brittle.

The color of staurolite is dark reddish brown to brownish black, and yellowish brown, and while it often looks like garnet it can easily be distinguished by reason of the fact that garnet is singly refracting and does not exhibit dichroism.

Staurolite occurs in France, Switzerland, Bavaria, Ireland, Scotland, Portugal, Brazil, Russia, Nova Scotia and the United States.

BERYLLONITE

Beryllonite is a rare native stone noted for its transparency and great brilliancy. Its cleavage is highly perfect, fracture conchoidal, refraction double, hardness 5.5 to 6, specific gravity 2.84, luster vitreous, it is soluble in hot acids and fuses under the blowpipe.

The composition of beryllonite is

Phosphorous pentoxide	55.90
Beryllium oxide	19.70
Soda	24.40
	100.

This stone varies in color from colorless to pale yellow and the natural faces of the crystals found at Stoneham, Maine, are often delicately etched.

CASSITERITE

Cassiterite is of slight importance as a gem stone as it is usually opaque and rarely found in transparent crystals suitable for cutting.

Cassiterite is an oxide of tin, transparent to opaque, 6 to 7 in hardness, with the specific gravity of 6.8 to 7.1, imperfect cleavage, fracture subconchoidal to uneven, brittle and with an adamantine luster.

This very heavy stone when perfectly transparent and pale in color may be cut into a very lustrous gem. The color of cassiterite is generally brown or black and sometimes yellow, red or white--the transparent crystals being usually very small, showing strong double refraction.

This stone is found in Ireland, Cornwall, Bohemia, Saxony, East Indies, Australia, Bolivia, Mexico and the United States.

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DIASPORE

Diaspore is a hydrated sesquioxide of aluminium rarely cut as a gem. The name signifying in Greek "to scatter" was given on account of its tendency to decrepitate before the blowpipe.

Its cleavage is eminent, fracture conchoidal, hardness 6.5 to 7, specific gravity 3.3. to 3.45, luster brilliant being pearly on the cleavage face and vitreous elsewhere, it is brittle, transparent to translucent, strongly doubly refractive and it is not attacked by acids.

The colors of diaspore are white, greenish gray, brown yellowish, topaz yellow to colorless--sometimes violet blue in one direction, reddish plum in another and pale asparagus green in a third direction. Diaspore bears some resemblance to topaz but is softer and lighter. This stone is found in the Urals, Hungary, France, Sweden, Norway, Switzerland and the United States.

RHODONITE

Rhodonite, a member of the pyroxene group, is a silicate of manganese. While it is found in small transparent crystals the variety used for jewelry and ornaments is the massive or compact variety.

The hardness of rhodonite is 5.5 to 6.5, specific gravity 3.5 to 3.6, cleavage perfect to less perfect, fracture conchoidal to uneven, luster feebly vitreous and colors light brownish red, rich flesh red, rose pink, grayish pink, sometimes greenish or yellowish, and some of the massive variety is stained by seams of black oxides of manganese, making a strong contrast which adds to the beauty of the stone when cut.

Rhodonite is largely used in Russia, where it is fashioned into many kinds of objects, such as jewelry, jewel caskets, tables, mantels, altars and pillars of churches; in fact the sarcophagus of Czar Alexander II is constructed entirely of this stone.

Rhodonite occurs in Sweden, the Harz Mountains, Urals, Hungary, Cornwall, Algiers, Mexico, Australia and the United States.

LEPIDOLITE

Lepidolite is a lithia mica occurring massive of fine granular structure, which is sometimes used for small ornaments, dishes, vases, paper weights and occasionally is cut cabochon for low priced jewelry, but it has practically no value as a gem stone.

Its specific gravity is 2.8 to 2.9, hardness 2.5 to 4., luster pearly, and it is translucent to opaque.

Its colors are pink, lavender, heliotrope, rose red, violet, gray, yellowish, grayish white and white.

Lepidolite is found in Sweden, Saxony, Urals, Moravia, France, Elba, Cornwall, Scotland, Ireland, England and the United States; some beautiful colored stones being found at Mount Mica, Maine.

OBSIDIAN

MOLDAVITE

Obsidian, lava, black lava glass, volcanic glass, glass agate, bottle-stone, Icelandic agate and markenite or mountain mahogany, are different names used by lapidaries and dealers to describe a glass produced by volcanic fire.

This glass is a melted lava containing various minerals, principally potash felspar.

Obsidian, like other glass, is perfectly amorphous, hence singly refractive.

Its fracture is conchoidal, luster vitreous to greasy, hardness 5. to 5.5, specific gravity 2.3 to 2.6; it is very brittle, takes a high polish, fuses before the blowpipe and like ordinary glass is attacked by hydrofluoric acid.

Obsidian occurs in many colors and some of this material makes very attractive low-priced ornamental stones for jewelry. These colors are black, gray, brown, yellow, red, green, blue, some banded with alternate layers of black and brown and brown and gray; this material is always deeply colored, and while thin pieces are transparent, most obsidian is either translucent or almost opaque.

Obsidian was well known to the ancients, who made mirrors, gem cylinders and other objects from it, while the more primitive races fashioned it into spear and arrow heads, knives and other tools and weapons.

Obsidian occurs in globules or masses and is found in Italy, Hungary, Iceland, Mexico, Siberia, Asia, Canada and the United States.

There is much confusion about moldavite, as some authorities believe it to be a green variety of obsidian; others contend that its origin is to be sought in meteorites, while a third view is that it is an artificial glass from the site of early glass factories in Moravia, where it was originally found and named moldavite.

The discovery, however, of rolled pebbles of moldavite in the gem gravels of Ceylon seems to indicate that the obsidian theory is the correct one.

Moldavite is also known as water, chrysolite, pseudo chrysolite and bottlestone--it somewhat resembles peridot, but is softer and much lighter.

HAEMATITE

Haematite, specular iron ore, iron glance and micaceous iron ore is a sesquioxide of iron found all over the world. This mineral is also called bloodstone, because minute crystals appear blood red in color by transmitted light.

Haematite is opaque, has the specific gravity 4.9 to 5.3, is 5.5 to 6.5 in hardness, is infusible, metallic in luster with a red streak and of red color when reduced to powder.

HAEMATITE (Continued)

Its color is dark steel gray to iron black and it is composed of:

Iron	70
Oxygen	30

Haematite was well known to the ancients and is supposed to be the "bloodstone" of Theophrastus. In fact it is still called blutstein by the Germans. The deep black variety is often cut to simulate black pearls and it has also been extensively used for ornaments, intaglios and cabochon shapes for jewelry.

The island of Elba, India, Brazil and the Alps are some places where this mineral is found.

ILMENITE

Ilmenite is very similar in appearance to haematite, and is also used for ornamental purposes--the chief differences between the two minerals being the presence of titanium dioxide in ilmenite, and the occasional quality of magnetism which is never found in haematite.

Ilmenite occasionally has a black instead of a red streak and is susceptible of even a higher polish than haematite.

Ilmenite is found at Cumberland in the State of Rhode Island.

LAZULITE

Lazulite, named from the Arabic, signifying the blue of heaven, has sometimes been called false lapis lazuli, but the only mineral for which it might properly be mistaken is turquoise, to which it is similar in composition.

This stone, which is very rare in the gem trade, is a hydrated phosphate related chemically to turquoise, but is both softer and heavier than the latter stone.

Lazulite is brittle, has indistinct prismatic cleavage, vitreous luster, is subtranslucent to opaque, 5. to 6 in hardness, has a specific gravity of 3. to 3.1, and is of a fine deep blue color, sometimes azure blue.

Lazulite occurs in Germany, Switzerland, Sweden, Brazil, India and the United States.

HAÜYNITE

Haüynite is a member of the sodalite group, named in honor of the celebrated French mineralogist Abbe Haüy.

This mineral is somewhat rare and is a complex silicate forming part of lapis lazuli.

Haüynite is subtransparent to translucent, is 5.5 to 6. in hardness, has the specific gravity of 2.4 to 2.5, distinct cleavage, vitreous to somewhat greasy luster and loses color before the blowpipe and fuses into porous glass.

The water is kept at a constant temperature of 20°C.

When the water is at 20°C, the rate of evaporation is 0.5 g/hr.

It is found that the rate of evaporation is proportional to the surface area of the water, and to the difference between the vapor pressure of the water and the partial pressure of the water vapor in the air.

The rate of evaporation is found to be proportional to the square root of the difference between the vapor pressure of the water and the partial pressure of the water vapor in the air.

EXPERIMENT

The purpose of this experiment is to determine the rate of evaporation of water from a surface of known area, and to compare the results with the theoretical predictions.

The apparatus consists of a glass dish of known area, a balance, and a supply of water.

The rate of evaporation is determined by measuring the loss of mass of the water over a known period of time.

RESULTS

The rate of evaporation is found to be proportional to the surface area of the water, and to the difference between the vapor pressure of the water and the partial pressure of the water vapor in the air.

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CONCLUSIONS

The rate of evaporation is found to be proportional to the surface area of the water, and to the difference between the vapor pressure of the water and the partial pressure of the water vapor in the air.

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HAUYNITE (Continued)

The colors are indigo, sky and greenish blue, asparagus green, gray green, red, yellow and black.

Hauynite occurs in Italy, Azores, Siberia, Auvergne, Scotland and the United States.

DIOPTASE

Dioptase, emerald copper, copper emerald, emerald malachite or emeraldine is a hydrous silicate of copper of deep emerald green color which is found in small imperfectly transparent crystals, but is rarely cut as a gem because of its lack of hardness and transparency.

Its specific gravity is 3.28 to 3.35, hardness 5., cleavage perfect, fracture conchoidal, luster vitreous, refraction double, pleochroism weak and it is brittle.

Dioptase is found in Siberia, Hungary, French Congo, Chili and the United States.

APATITE

Apatite, asparagus stone or moroxite, is a phosphate of calcium containing chlorine and fluorine, and while this mineral is harder than fluorite it is too soft for extensive use in jewelry.

Apatite is, however, interesting to the jeweler because of its range of colors, and the danger of confusing this stone with harder gems stones of like colors.

The specific gravity of apatite is 3.17 to 3.23, its hardness 5., luster vitreous inclining to resinous, cleavage imperfect, fracture conchoidal and uneven; it is transparent to opaque, slightly dichroic and is weakly doubly refractive.

The colors are sea green, bluish green, deep green (known as moroxite); pale yellow (known as asparagus stone); sky blue, violet blue, gray, rose red, flesh red, brown, lilac, violet and sometimes white.

Very fine pink and violet crystals are found in the tourmaline locality at Auburn, Maine, on a hill called Mount Apatite.

Apatite is also found in Saxony, Urals, Tyrolean Alps and Norway. Fine crystals have been found in Canada weighing hundreds of pounds.

The colour was yellow, and greenish blue, sometimes green, and
green, red, yellow and black.

Plants were found in India, America, Europe, Africa and
Australia.

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HYPERSTHENE

Hypersthens, bronzite, bastite, diallage and enstatite are members of the pyroxene or augite group of minerals which, though never sufficiently transparent for facetting, exhibit a peculiar metallic sheen on one particular face which when cut cabochon results in effective looking stones of the labradorite type.

Hypersthens, Labrador, Hornblende or paulite, the most important of this group, is translucent to opaque, has the specific gravity of 3.4 to 3.5, is 5. to 6. in hardness, has perfect cleavage, uneven fracture is brittle, is partially decomposed by hydrochloric acid and fuses easily before the blowpipe.

The colors of hypersthene are dark brown, red, brownish, green and grayish black--when viewed in one certain direction the color is a magnificent copper red, a light brown or a golden yellow, while in other directions it generally exhibits a greenish play of colors.

Hypersthene is found with labradorite on the Island of St. Paul, Labrador, and in other localities.

BRONZITE

Bronzite, so named because of the bronze-like flash of some of this material, is in reality hypersthene containing about 12 to 14 per cent more iron.

Its specific gravity is 3.1 to 3.3, hardness 5.5, cleavage easy, fracture uneven; it is translucent to opaque, its luster on cleavage surfaces is pearly to vitreous and it is brittle. The colors of bronzite are bronze yellow, grayish green to olive green and brown.

Some stones have a fibrous structure and when carefully cut they resemble the catseye.

Bronzite is found in Bavaria, Moravia, Styria, Tyrol, the United States and other localities.

BASTITE

Bastite or schiller spar, is altered enstatite, mineralogically identical with bronzite, but leek to olive green and brown in color.

Its specific gravity is 2.5 to 2.7, hardness 3.5 to 4, has a bronze-like luster or "schiller" on the chief cleavage face and was originally found at Baste in the Harz Mountains, hence its name.

DIALLAGES

Diallage, less closely related to hypersthene, is near diopside in composition, often containing a large amount of alumina.

Its specific gravity is 3.20 to 3.35, hardness 4., luster pearly, sometimes metalloidal and resembling bronzite, and its colors are greenish gray to bright grass green, deep green and brown.

Diallage is found in Silesia, the Alps, Italy and the Isle of Skye.

The hypophysis, or pituitary body, is a small, pea-sized mass of soft, greyish tissue, situated at the base of the brain, in the sella turcica of the sphenoid bone. It is composed of two parts, the anterior and posterior lobes, which are separated by a thin layer of connective tissue.

The anterior lobe, or adenohypophysis, is the larger of the two, and is composed of a mass of cells, the nuclei of which are stained by the usual methods. It is situated in front of the posterior lobe, and is separated from it by a thin layer of connective tissue.

The posterior lobe, or neurohypophysis, is the smaller of the two, and is composed of a mass of cells, the nuclei of which are stained by the usual methods. It is situated behind the anterior lobe, and is separated from it by a thin layer of connective tissue.

The hypophysis is situated in the sella turcica of the sphenoid bone, and is surrounded by a thin layer of connective tissue.

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ENSTATITE

Enstatite is practically bronzite with little or no iron, and while its luster is not as strongly metallic as that of bronzite, it is more pearly.

Its specific gravity is 3.1 to 3.3, hardness 5.5, cleavage easy, fracture uneven; it is brittle, translucent to nearly opaque, infusible before blow-pipe, and is perceptibly dichroic, the twin colors being yellowish and green.

Its colors are grayish white, yellowish white, and greenish white to olive green and brown.

Enstatite is found with bronzite and a green variety is a common constituent of peridotites accompanying the diamond of South Africa--some of this green material has been cut and sold as green garnet.

CYANITE

KYANITE, SAPPHIRE, DISTHENE

Cyanite, kyanite, sapphire or disthene, is a silicate of aluminium closely related to topaz and almost identical in composition with andalusite.

The name kyanite, from the Greek, refers to the color of the blue stones, the name sapphire is a corruption of sapphire and arose from a mistake made by a French mineralogist in reading the label of a specimen from Scotland, and the name disthene from the Greek, signifying "two strengths," refers to a peculiarity of this stone, inasmuch as its hardness differs greatly on different faces of its crystals, varying between 7.25 and 5.00.

The specific gravity of cyanite is 3.56 to 3.67, hardness 5.00 to 7.25, dichroism distinct but not very strong, luster vitreous to pearly; it is infusible before the blowpipe, is not attacked by acids, is not very brittle and is transparent to translucent.

The colors are fine deep blue sometimes resembling sapphire; white, gray, green and black.

Cyanite is found in Brazil, India, Sweden, Russia, Mt. Gothard and the United States.

WILLEMITE

Willemite, named after William I, King of the Netherlands, is a silicate of zinc, which is occasionally cut as a gem stone.

Its specific gravity is 3.89 to 4.18, hardness 5.5, luster vitreous to resinous, refraction double, cleavage easy and it is transparent to opaque.

The colors of willemite are rich honey yellow, white or greenish yellow, apple green, flesh red, grayish white and yellowish brown.

Apple green, crystals, found at Franklin Furnace, New Jersey, are often sufficiently transparent to cut furnishing an American stone whose name begins with a W to represent the names of states beginning with that letter.

This mineral is also found in Belgium, Greenland and New Mexico.

CHALCHIHUITL

Aztec Stone

Calamine, chalchihuitl, or aztec stone, is a hydrous silicate of zinc which has been used to a certain extent for ornamental purposes.

Blue, gray and green translucent calamine with curved and banded markings has been commercially called chalchihuitl, or aztec stone, although the name chalchihuitl has long been given to other blue and green minerals notably turquoise and jadeite.

Its specific gravity is 3.4 to 3.5, hardness 4.5 to 5., its fracture is uneven to sub-conchoidal, cleavage perfect, luster vitreous to pearly, and it is transparent to translucent.

Its colors are white, gray, bluish, greenish, yellowish, also violet and brown.

Calamine is found in Mexico, Europe and the United States.

SMITHSONITE

Bonamite

Smithsonite is a zinc carbonate, named after John Smithson, the founder of the Smithsonian Institute at Washington.

The apple green variety sometimes resembles chrysoprase, but is much inferior to that stone on account of lack of hardness--this green smithsonite when cut has been sold under the name of bonamite.

Smithsonite has a specific gravity of 4.30 to 4.45, is 5. in hardness, has a perfect cleavage, uneven fracture and a luster vitreous inclining to pearly--it is brittle and sub-translucent to translucent.

The colors are green, grayish, brownish, white and blue.

Smithsonite is found in New Mexico, Siberia, Hungary, Spain, Greece, England and elsewhere.

DIOPSIDE

Diopside, malacolite or alalite, is a calcium magnesium pyroxene remarkable among the members of the pyroxene group for its transparency, and on this account it is sometimes cut as a gem.

The specific gravity of diopside is 3.20 to 3.38, hardness 5 to 6, cleavage perfect, double refraction large it is transparent to translucent, it is unaffected by acids and its luster is strongly vitreous to resinous, sometimes pearly but often dull, resembling dull green tourmaline or epidote.

The colors of diopside are white, yellowish, grayish white to pale green, dark green to nearly black, leaf green and oily green.

Most of the material cut as gems in Turin, Italy, is of the bottle green variety found in the Ala Valley, Piedmont (hence the name Alalite).

Diopside is also found in the Tyrol, Urals and the United States.

PLANT LIFE

ALPINE PLANTS

Collected, 1911, at Lake Louise, in a high alpine region, in a high alpine region, in a high alpine region.

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CANCRINITE

Cancrinite, named after Count Cancrin, Russian Minister of Finance, is a member of the nephelite group of orthosilicates and is sometimes cut and used as a gem.

Its hardness is 5. to 6., specific gravity 2.42 to 2.50, luster sub-vitreous or a little pearly or greasy, and it is only strongly translucent and never perfectly transparent.

Its colors are a bright orange yellow to pale yellow, gray, green, blue, reddish and white.

Cancrinite is found in the Urals, Norway, Transylvania and the United States.

ELAEOLITE

Elaeolite, another member of this group, has the same chemical elements as cancrinite, containing, however, in addition, carbon dioxide and water and being somewhat heavier.

Elaeolite has the specific gravity of 2.59 to 2.65, is 5.5 to 6. in hardness, its luster is greasy and it is commonly massive.

This stone, which could probably be employed for moderate priced jewelry when cut en cabochon, is found in rich flesh red, cinnamon yellow and brown colors in Norway, Siberia, Greenland, Portugal and the United States.

DATOLITE

Datolite is a basic orthosilicate of boron and calcium, the compact massive variety of which takes a high polish and makes an excellent opaque gem.

Its hardness is 5. to 5.5., specific gravity 2.9 to 3., fracture conchoidal to uneven, luster vitreous and it is transparent to opaque.

It varies in color from pure opaque white in compact massive variety to cream color, honey yellow, red and purplish in translucent material--some stones have dark streaks and mottlings of different colors.

Attractive gems and ornaments are cut from datolite found in the copper region of Lake Superior and sold by local jewelers to tourists.

This mineral is also found in Scotland, Norway, Sweden, Bavaria, Tyrol, Baden, Bohemia, Alsace, Italy and the United States.

PERISTERITE

Albite moonstone, as distinguished from the regular or adularia moonstone, is called peristerite, and is occasionally found in fine chatoyant specimens, often colored with pale shades of green or yellow.

Its hardness is 6. to 6.5, specific gravity 2.62; its cleavage perfect to imperfect; it is brittle and its fracture is uneven to conchoidal.

Peristerite (from the Greek) signifies pigeon, and this name was given because of its iridescent colors, which are supposed to resemble the colors of a pigeon's neck.

Peristerite is found in several localities in the United States and in Canada.

FLUORITE

While hardness or durability is one of the most important qualities of a gem stone, some soft minerals, by reason of their beauty and adaptability for ornamental purposes, are sometimes effectively employed in jewelry.

In addition, therefore, to some of the comparatively soft stones recently described in this gem card series, it may be serviceable to the trade to briefly refer to some other stones which, though rarely used, may nevertheless come under the notice of the jeweler.

Fluorite or fluor spar, though much too soft for a gem stone, is nevertheless sometimes cut and worn in jewelry because of its beautiful colors.

This great range of colors embraces green, red, pink, blue, violet, yellow, brown and sometimes colorless, and the cut stones are often known as false emerald, false ruby, false sapphire, false amethyst and false topaz.

Fluorite is composed of:

Fluorine	48.9
Calcium	51.1
	100

Its hardness is 4., specific gravity 3.10 to 3.25, luster vitreous, it is transparent to sub-translucent, has perfect cleavage, is brittle and gives out a phosphorescent light under even a low temperature.

Fluorite is widely distributed over the earth, some of the finest crystals, however, being found in England.

NATROLITE

Natrolite is a hydrated silicate of sodium and aluminium and, like thomsonite, belongs to the zeolite group.

Its hardness is 5. to 5.5, specific gravity 2.2 to 2.5, fracture uneven, luster vitreous, inclining to pearly, and it is transparent to translucent.

The stones cut as gems are the translucent variety, which is found, in fibrous divergent or radiated masses, with colors alternating yellow, yellowish, reddish and grayish in concentric bands.

Natrolite is found in Germany and in the United States.

APOPHYLLITE

Apophyllite is a hydrous silicate of potassium and calcium, and because of its curious resemblance to the eye of a fish it is also known as ichtyophthalmite or fish-eye. Some of these stones have a rich brown color, with a fine white chatoyant luster and, though very soft, make good cats' eyes.

Its hardness is 4.5 to 5, specific gravity 2.3 to 2.5; cleavage easy, luster pearly; it is brittle and is transparent to nearly opaque.

Its colors are brown, white or grayish, yellowish, greenish and sometimes a faintly pink.

Apophyllite occurs in Mexico, Greenland, India, Nova Scotia, Brazil, Sweden, the United States and other places.

RHODOCROSITE

Rhodocrosite is a manganese protocarbonate and is sometimes confused with rhodonite, which is a harder stone.

Its hardness is 3.5 to 4.5, specific gravity 3.45 to 3.60; cleavage perfect, luster vitreous, inclining to pearly; it is brittle and translucent to subtranslucent.

Rhodocrosite is found in Europe and the United States in rose red, yellowish gray, fawn colored, dark red and brown colors; and while it is sometimes cut into vases and like ornaments, it is rarely used for jewelry.

ARAGONITE

Aragonite, or satin spar, is a calcium carbonate, first discovered at Aragon, Spain, and now used principally as an ornamental stone by marble workers, although some of the more strikingly colored material is fashioned into ornaments and small articles usually sold for souvenirs at watering places.

Its hardness is 3.5 to 4, specific gravity 2.93 to 2.99; cleavage distinct, also imperfect, fracture subconchoidal; it is transparent to translucent and brittle.

The colors of aragonite are white, gray, yellow, green, violet, red, amber and brown.

Aragonite is found in Bohemia, Baden, Silesia, Hungary, Wales, Chili and the United States.

SPHALERITE

Sphalerite is a zinc sulphide, composed of one-third sulphur and two-thirds zinc, which is sometimes cut as a gem because of its beautiful adamantine luster. Its lack of hardness and the great difficulty experienced in cutting this mineral, because of its tendency to go to pieces on the wheel, largely accounts for its rare use as a gem stone.

The hardness of sphalerite is 3.5 to 4., specific gravity 3.9 to 4.2; fracture conchoidal cleavage very perfect, luster resinous to adamantine; it is transparent to translucent and brittle.

Its colors are yellow, brown, black, red, green and white.

LUMACHELLE

Lumachelle, shell or fire marble, consists of a brown limestone containing numerous fossil shells from which fiery red, green or yellow chatoyant light is reflected, making this material resemble opal matrix.

It is easily distinguished from the opal matrix, however, because of its lower hardness and its effervescent action with acid.

This mineral is a calcium carbonate with the hardness of 3. and specific gravity of 2.71. It is found in Carinthia and Astrakan.

SATELITE

A variety of serpentine found in the West has been named satellite.

This is an opaque stone, greenish gray along the fibers and dark green across them.

When cut cabochon the cat's eye effect is good.

Phlox pilularis is a perennial herbaceous plant with a woody base, and is common in the mountains, where it is a native plant.

The flowers are 2 to 4, usually 3, in a cyme, and are of a deep blue or purple color, with a white center, and are very fragrant.

Phlox pilularis is found in the mountains of the United States in the Pacific States, where it is a native plant, and is very common in the mountains, where it is a native plant.

SYNOPSIS

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AMBER

Amber, succinite, succinium, electrum, lyncurium and northern gold are various names employed at different times to designate a mineral of vegetable origin which claims the highest antiquity among precious stones used for personal adornment.

It was the one precious stone known to the early Greeks, who called it electrum on account of its electrical susceptibilities, and it is the only stone mentioned by the poet Homer.

The Greeks bought worked amber from the Phoenicians, who sailed to the Baltic for the sole purpose of obtaining this mineral.

That it was highly valued is proven by the satirical observation of Pliny, who states that the price of a figurine in amber, however small, exceeded that of a healthy living slave. The Romans called it succinium, signifying "juice", as they concluded, from the insects and plants inclosed in amber, that it was a vegetable juice.

Many wonderful qualities were claimed for amber. It was supposed to cure ague, keep off attacks of erysipelas from a person subject to them and defend the throat of the wearer against chills. The warmth of amber when in contact with the skin and its electrical properties are adduced as a good reason for its protective and remedial qualities.

Amber is the fossilized resin of an extinct species of either the pine or fir tree, known for want of a better name as the amber tree or pinites succinifer.

Amber is composed of:

Carbon	78.94
Hydrogen	10.53
Oxygen	10.52
Sulphur	.05

Its hardness is 2. to 2.5, specific gravity 1.050 to 1.096; luster resinous, streak white; it is transparent to translucent, often clouded, sometimes fluorescent and is negatively electrified by friction.

Amber is a very bad conductor of heat, being perceptibly warm to the touch, and for this reason can be readily distinguished from glass imitations, which are also much heavier than genuine amber.

Amber begins to soften at 150 degrees and finally melts at 250 to 300 degrees. This enables dealers to produce a large quantity of an inferior amber called ambroid by the fusion under pressure of small, comparatively worthless, pieces of amber into large compact cakes.

Ambroid is used where a cheaper material than the natural amber is required, but, while it is a good substitute for many purposes, it lacks the brilliancy and fine wearing qualities of the natural stone.

AMBER (Concluded)

While the color of amber is principally different shades of yellow it is also found in reddish, brownish and whitish colors.

Over one hundred and fifty different species of insects have been found entombed in amber, many of them identical with present-day insects, while most of the plants imbedded in amber are different from the vegetation now found in the amber regions.

Burmese amber or burmite differs from true amber or succinite, inasmuch as it does not contain succinic acid.

Most of the amber found is used for smoker's articles, but important quantities are cut and carved into beads and distinctive jewelry and are sold in all quarters of the earth.

While amber occurs in England, Galicia, Moravia, Burma, Urals, Norway, Roumania, Sicily, Switzerland, France, Denmark, Sweden, the Russian Baltic Provinces and the United States, the most abundant and important supply is from the coast of the Baltic from Danzig, West Prussia, to Memel, East Prussia. The amber industry is an ancient one and was formerly followed by fishermen, who were the owners of all the amber they found.

Amber fishing and mining, however became for the most part a government monopoly and the government revenue from this mineral rose as high as \$788,000.00 in 1910.

While the value of copper is principally determined by its use in the manufacture of brass and other alloys, it is also used in the manufacture of electrical apparatus.

Over one hundred and fifty different species of insects have been found in the State, many of them identical with those found in other parts of the State. The insects found in the State are as follows:

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JET

Jet, black amber, fossil coal or fossilized wood, is a black variety of "brown coal", and is one of the oldest minerals of vegetable origin employed for jewelry. The hardness of genuine jet is 3. to 4., its specific gravity 1.3 to 1.4, luster greasy, structure compact, dense and homogeneous, fracture conchoidal and color a fine, deep, velvety black.

Jet is undoubtedly the gagate of Dioscorides and Pliny, its ancient name evidently being derived from the River Gages in Lycia, Asia Minor, where it was discovered. The Romans valued it chiefly for its supposed medicinal qualities and its power to avert certain evils. It was considered by them a sovereign remedy for many ills.

Jet must have been worked on lathes by the early Britons before the Roman conquest, as large jet rings have been discovered among British remains.

The manufacture of jet was a very important industry in France during the Revolution and in 1786 upwards of 1200 workmen were engaged in the manufacture of jewelry and ornaments from jet in the Department of Aube. In time, however, this industry fell into decay. The same fate followed the industry in Germany, where fine deposits were found in the Swabian Alps, but notwithstanding government encouragement and support, it was impossible to establish the jet cutting industry on a basis to compete successfully with the English manufacturers.

The famous English jet cutting works are situated at Whitby, a place on the Yorkshire coast, and within a few miles of the rich deposits of hard jet which has made Whitby the home of the world's jet industry. Two qualities of jet are worked here; the fine, hard, native jet and a softer, cheaper quality imported from Spain.

Cannel or candle coal is also worked into ornaments, producing an inferior article which has a grayish or brownish color, is more brittle and does not take the fine, high polish of genuine jet.

Jet furnishes a suitable material for the manufacture of mourning jewelry and ornaments, as it can readily be worked with file, knife, graver and lathe into artistic shapes and its light weight makes it particularly adaptable for large chains and other jewelry.

Notwithstanding the comparative cheapness of jet, this mineral is largely imitated in various ways, glass being of course the simplest and most satisfactory imitation; in fact, the trade name "jet" is generally employed in describing millinery and dress ornaments made of black glass, and this often without the slightest intention of deceiving the purchaser.

Genuine black onyx is also very much like jet in appearance, but as it is very much heavier and harder it is thus readily distinguished.

Vulcanite, another imitation of jet, is molded, and therefore always lacks the fine lines of the cut jet.

Jet is a very poor conductor of heat, and feels warm to the touch. It is thus readily distinguished from other minerals such as black onyx, black tourmaline, and from glass and obsidian.

Jet occurs in England, France, Spain, Germany and the United States. It also sometimes occurs on the Baltic with amber, and is there called black amber.

CORAL

Red precious coral, *corallium rubrum*, noble coral and *corallium nobile*, are different names for a marine production which the orientals have always classed among precious stones notwithstanding its animal origin.

Coral was employed in the arts in ancient days and according to the prophet Ezekiel it was a valuable article of merchandise with the Tyrians who imported it from Syria.

The Greeks consecrated coral to Jupiter and Apollo and they had a tradition that it was formed from the blood of Medusa, whose head Perseus hung on a tree near the sea, the coagulated drops of blood of which were transferred to the water by the nymphs to become coral.

Pliny writes that the demand for coral was so great in India that it was rarely seen in the country in which it was found.

Coral is formed by a lowly organized animal, the coral polyp, whose calcareous habitations resemble branches of trees.

These red stems or branches are covered with a layer of living material known to zoologists as coenosarc, and imbedded in this material are great colonies of milk white polypi, who build up the coral stems until they are sometimes over twelve inches long and an inch thick.

Precious red coral is largely found in the Mediterranean Sea and its inlets and is taken at various depths ranging from ten to nine hundred feet; the best coral is said to be found at two hundred and fifty to six hundred feet and is recovered by diving both with and without diving apparatus and by the employment of a heavy drag which is equipped with a number of small nets to catch or entangle the coral which is broken from the rocks.

This fishing is carried on principally by Italians, as many as 460 boats having been employed in the fishery and six thousand persons in the cutting, polishing drilling and carving of this popular gem.

While some beautiful coral comes from Japan, the bulk is gathered from numerous banks of the coasts of Sardinia, Sicily, Northern Africa and the Adriatic.

A natural black coral sometimes used for mourning jewelry is found in the Indian Ocean; it is used by the native rulers for the making of their scepters and is therefore known as "King's Coral."

Coral has always been used to a greater extent in China and India than in Europe, and some of the finest and most costly specimens are used as buttons for Mandarins' caps.

Coral was long used as an amulet, and it was not until 1727 that its true nature was discovered by a Frenchman, M. Peyssonel.

Coral is calcium carbonate with a small amount of organic matter.

Its specific gravity is 2.6 to 2.7 and hardness $3\frac{3}{4}$.

Coral varies in color from pure white to the darkest blood red: the dark red coral was at one time most sought after, at the present day, however, the paler pink tints bring the highest prices.

Over one hundred different shades of pink are said to be recognized by the coral experts at Marseilles, the regular colors being known as:

Bianco, pure white; pelle d'angelo, pale flesh red; rosa pallide, pale rose; rosa vivo, bright rose; secondo colore, second color; rosso, red, rosso scuro, dark red; and carbonetto or ariscuro, darkest red.

Coral is imitated by many substances and genuine coral is sometimes faded or bleached with acid--the color is, however, then duller than the natural coral.

White coral is sometimes artificially dyed by means of analine coloring, but this color fades in a short time.

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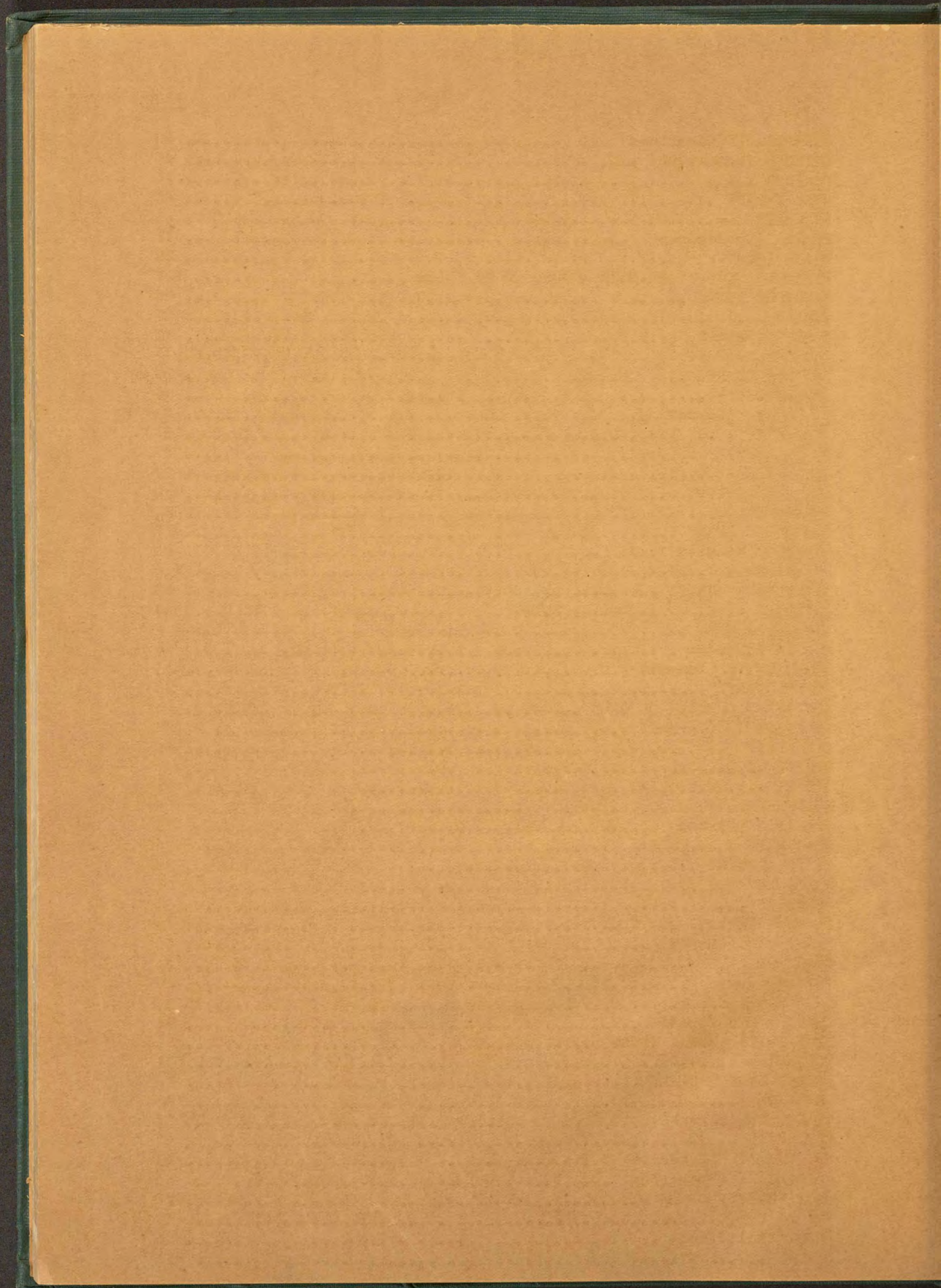
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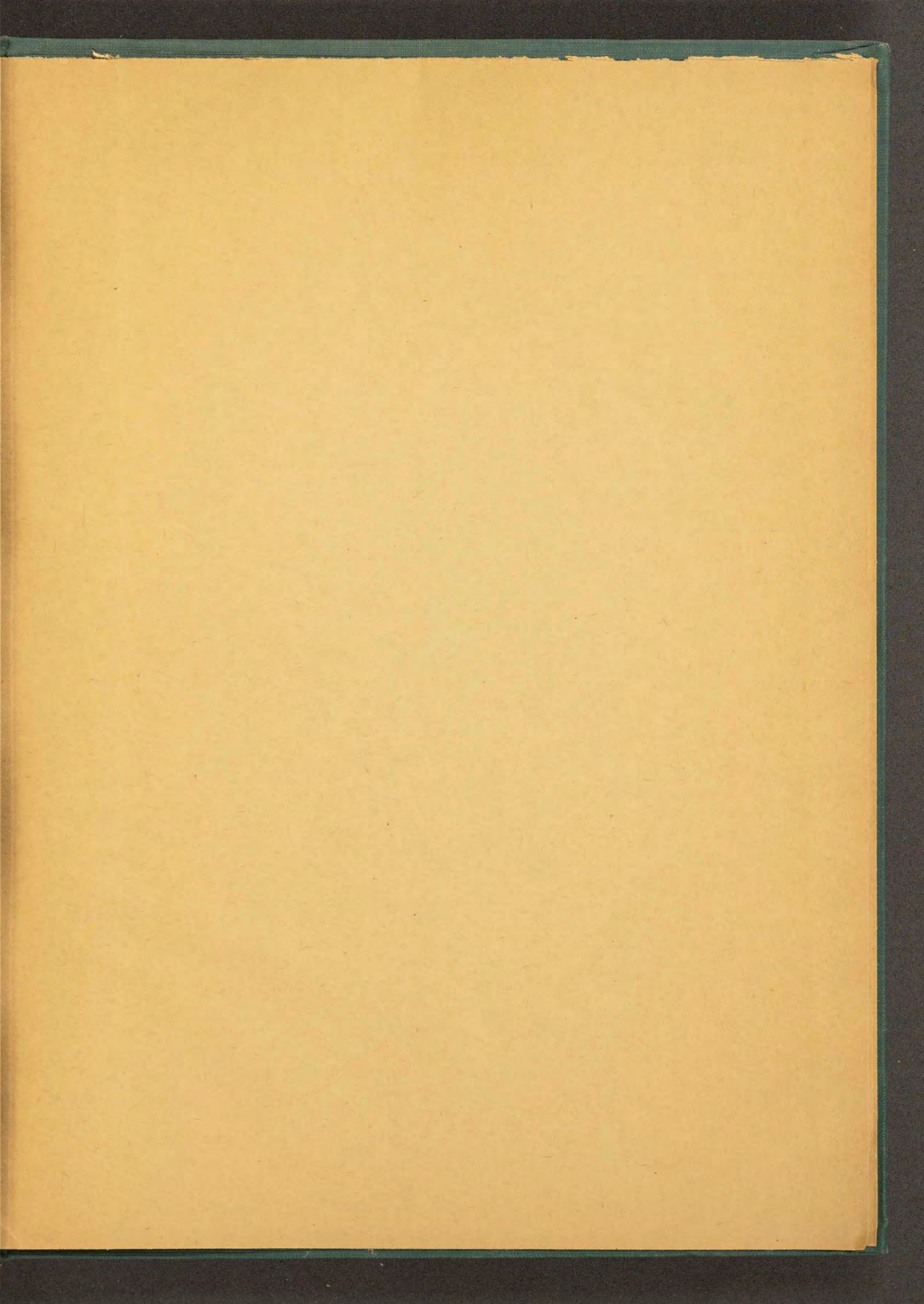
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